

CONVOLVULACEAE OF SONORA, MEXICO. I.  
CONVOLVULUS, CRESSA, DICHONDRA, EVOLVULUS, IPOMOEA,  
JACQUEMONTIA, MERREMIA, AND OPERCULINA

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ABSTRACT

Based on decades of field work and herbarium research we document 84 species of Convolvulaceae (convolvus) in nine genera for the state of Sonora, Mexico: *Ipomoea* (41 species), *Cuscuta* (21), *Evolvulus* (6), *Jacquemontia* (4), *Merremia* (4), *Dichondra* (3), *Convolvulus* (2), *Operculina* (2), *Cressa* (1). This species richness compares with the more tropical regions of southern Mexico (e.g., Bajío region, Veracruz) and Central America (Costa Rica, Nicaragua). Convolv species occur in a diverse range of plant communities from intertidal zones to mountain conifer forest, with highest diversity in tropical deciduous forest and oak woodlands in ten major vegetation types: tropical deciduous forest (44), oak woodland (34), Sonoran desert (33), foothills thornscrub (31), coastal thornscrub (30), pine-oak forest (27), grassland (13), Chihuahuan desert (11), coastal salt scrub and mangroves (1), and mixed conifer forest (1). Nearly 10 percent of the Sonoran convolvus are not native to the region. The majority of worldwide and Sonoran convolvus are scandent annuals or herbaceous perennials with twining stems. Three native Sonoran *Ipomoea* are trees or large shrubs: *I. arborescens*, *I. chilopsidis*, and *I. seaania*. The *Cuscuta* of Sonora are discussed in a separate article in this volume (Costea et al. 2012a).

We revise the nomenclature and typification of all the taxa. We give the correct names and synonyms for all taxa and provide special attention to details regarding the place of publication and type specimens. Lectotypes are chosen for nine species. Special attention has been paid to providing correct authorities and publication information in view of incorrect data that circulated in major floristic and biodiversity databases. Dichotomous identification keys, detailed descriptions, phenology, local and global geographic distribution data are provided. Known indigenous names and uses are given for Sonoran convolvus when known.

KEY WORDS: floristic diversity, ecology, geographic distribution, Mexico, Sonora, vegetation, typification

RESUMEN

Décadas de trabajo de campo e investigación de herbario permitieron documentar 84 especies en 9 géneros de la familia Convolvulaceae en el estado de Sonora, México: *Ipomoea* (41 especies), *Cuscuta* (21), *Evolvulus* (6), *Jacquemontia* (4), *Merremia* (4), *Dichondra* (3), *Convolvulus* (2), *Operculina* (2) y *Cressa* (1). Esta riqueza es comparable con la de regiones más tropicales del sur de México (ej. región del Bajío, Veracruz) y América Central (Costa Rica, Nicaragua). Las especies se distribuyen en un rango diverso de comunidades vegetales desde áreas entre mar-eas hasta montañas con bosques de coníferas. La más alta diversidad se encuentra en la selva baja caducifolia (44), seguida por el encinal (34), matorral del desierto sonorense (33), matorral espinoso de piedemonte (31), matorral espinoso costero (30), bosque de pino-encino (27), pastizal (13), matorral del desierto chihuahuense (11), matorral salado costero y manglares (1) y bosques de coníferas mixtas (1). Cerca del 10% de las Convolvulaceae de Sonora son introducidas.

La mayoría de las Convolvulaceae del mundo, incluyendo Sonora, son anuales escandentes o herbáceas perennes trepadoras. Tres *Ipomoea* nativas de Sonora son árboles o arbustos: *I. arborescens*, *I. chilopsidis* y *I. seaania*. El género *Cuscuta* se discute en un artículo separado en este mismo volumen (Costea et al. 2012a).

Se revisó la nomenclatura y la tipificación de todos los taxones. Se proporciona el nombre aceptado, nombres de autoridades y los sinónimos, así como la publicación y los ejemplares tipo. Se escogieron lectotipos para 9 especies. Se incluyen claves dicotómicas de identificación, descripciones detalladas, fenología, así como datos de distribución geográfica mundial y local. Se citan nombres comunes y usos de las especies en Sonora.

## INTRODUCTION

The Convolvulaceae constitute a large and diverse assemblage of 58 genera and about 1800 species worldwide (Staples 2011). This monophyletic family has greatest diversity in tropical and subtropical regions worldwide and does not generally occur in higher latitudes. The sweet potato (*Ipomoea batatas*) and water spinach (*I. aquatica*) are the only major crop plant in the family. In addition to species with horticultural value (e.g., various morning glories), there are significant crop weeds (e.g., certain species of *Convolvulus*, *Cuscuta*, and *Ipomoea*) and many medicinal uses among Sonoran people and worldwide. This publication is the first taxonomic account of all the known Convolvulaceae (convolvs) native or naturalized in the state of Sonora, Mexico (Fig. 1). We include approximately 84 species and 2 infraspecific taxa in 9 genera for the state. Due to the large size of the article, we divided it into two parts: the first part includes all the Convolvulaceae genera minus *Cuscuta*, while the second part provides a floristic/taxonomic treatment for the latter genus (Costea et al. 2012a). This introduction includes the 9 genera.

Although a political border is not necessarily an ecological or biological boundary, the borders of Sonora are to varying degrees biologically and logistically significant. The western boundary (except the extreme northwestern corner) is the Gulf of California. The east boundary mostly coincides with the continental divide. The north boundary marks a division between the better-known continental flora of Arizona and the relatively less-known flora of northern Sonora. The southern border with the state of Sinaloa border separates a continuous flora but is far enough south to include the northern climatological limits of the New World tropics (in east-central Sonora at 28–29°N).

Sonora encompasses 185,934 km<sup>2</sup> (Molina-Freaner & Van Devender 2010) and is the second largest state in Mexico after Chihuahua. The region is topographically and biologically diverse (Molina-Freaner & Van Devender 2010). Three major river systems, the Río Colorado, Río Yaqui, and Río Mayo, and several minor rivers systems course through the state and empty into the Gulf of California. The eastern margin of the state is comprised of the Sierra Madre Occidental and numerous north-south trending Sky Island ranges forming the Madrean Archipelago. The highest elevation is 2625 m in the Sierra de los Ajos in northeastern Sonora. The Sierra San Luis in the extreme northeastern corner is nearly as high, and another high peak, further south on the Chihuahua border, near Mesa Tres Ríos may be equally high. Numerous other ranges, generally decreasing in peak elevations westward, spread across the rest of the state, interspersed with broad valleys and expansive plains.

Sonora includes the northern limits of tropical and subtropical biota as well as some of the most arid desert regions of North America. Tropical species follows the lowland tributaries in the Río Yaqui drainage system northward in northeastern Sonora.

Total annual precipitation decreases from south to north and east to west, and increases with elevation. Rainfall is largely bi-seasonal with summer and winter-spring rainy seasons. Precipitation increases from west to east: for example from the Río Colorado River to northeastern Sonora/New Mexico, and with elevation and from north to south. Total annual precipitation varies from less than 40 mm in the extreme northwest of the state near the delta of the Río Colorado to about 1000 mm in southeast and east-central Sonora (e.g., Yécora at 1500 m) and probably considerably more farther north, such as the Tres Ríos–Sierra Huachinera region (Brito-Castillo et al. 2010; Felger et al. 2001; Martínez-Yrizar et al. 2010).

Human populations in Sonora remained sparse and major roads were relatively few until the mid-twenti-

eth century (e.g., Stoleson et al. 2005). Much diversity and richness of natural habitat remain, but like elsewhere, assaults on the environment are escalating (e.g., Castellanos-Villegas et al. 2010). Since the latter part of the twentieth century large areas of the state have been established for conservation purposes (e.g., Búrquez and Martínez–Yrizar 2007, Felger and Broyles 2007).

Major works including ethnobotanical information on convolvulids in Sonora include Felger and Moser (1985), Gentry (1942, 1963), Yetman and Felger (2002), and Yetman and Van Devender (2002). For summary information see species accounts for *Ipomoea ancisa*, *I. arborescens*, *I. bracteata*, and *I. pedicellaris*.

While soil moisture is the principal limiting factor in this generally arid region, freezing temperatures limit the northern distributions of the more tropical or subtropical species (e.g., Brito-Castillo et al. 2010; Shreve 1951; Turner et al. 1995; also see the species accounts for *Ipomoea arborescens*). Freezing weather is infrequent across most of Sonora, especially in the southern part of the state and at low to moderate elevations, and many habitats are essentially frost-free, but freezing temperatures become more frequent and severe northward and at higher elevations (Brito et al. 2010).

The total flora of the state includes about 3700 taxa (Van Devender et al. 2010 and new records). Within this rich flora, the Convolvulaceae is the seventh largest family, following the Asteraceae, Poaceae, Fabaceae, Euphorbiaceae (Steinman & Felger 1997), Malvaceae (s.l.), Cactaceae (Paredes et al. 2000), and Cyperaceae (Van Devender et al. 2010). With 42 taxa, *Ipomoea* is the fourth largest vascular plant genus in the state and the largest genus in the family worldwide. Among the documented convolvulid species in Sonora, we include species that occur in Arizona and New Mexico close to the northern boundary and are expected to occur in Sonora.

**Growth forms.**—Most convolvulids throughout the world are scandent annuals or herbaceous and woody perennials. Three native Sonoran *Ipomoea* are trees or large shrubs: *I. arborescens*, *I. chilopsidis*, and *I. seaania*. The non-native *I. carnea* subsp. *fistulosa* is a shrub while *I. bracteata* and some *Jacquemontia* may become somewhat shrubby. *Ipomoea bracteata* and *I. longiflora* form large tuberous roots, as do *I. capillacea* and *I. plummerae*, while *Merremia palmeri*, *Operculina pinnatifida*, and *O. pteripes* probably have large tuberous roots because their closest relatives have them.

The majority of Sonoran convolvulids are vining or have twining stems. The liana growth form, characteristic of tropical regions, occurs among *Ipomoea bracteata*, *I. pedicellaris*, several *Jacquemontia*, *Merremia quinquefolia*, and *Operculina pteripes*. All occur in tropical deciduous forest in Sonora and some also range into thornscrub and oak woodland. *Cuscuta* spp. are always annual when parasitic on annual hosts; however, when parasitizing on perennial woody hosts, some species such as *C. americana*, *C. corymbosa* var. *grandiflora*, and *C. tinctoria* are often perennial, regenerating every year from haustorial tissues left inside the stems of the host (Costea & Tardif 2006).

**Endemism and Rare/Endangered Taxa.**—Although many species may be locally rare and known from few collections in Sonora, most of these are common elsewhere. Only a small number of Sonoran convolvulids are rare and/or endangered throughout their range.

*Ipomoea seaania*, the only convolvulid endemic to the state of Sonora, is known only from the vicinity of the type locality and seems to be globally restricted to a relatively small area. Among *Cuscuta*, *C. dentatasquamata* is known in Sonora only from the type collection; *C. salina* is known from one locality in Sonora but is common elsewhere, and the only known Sonoran *C. tinctoria* specimen is a parasite on a cultivated tree and is not native. There are two records for *Dichondra brachypoda* in Sonora, both in mountains in the northeastern part of the state. *Evolvulus prostratus* is known from two collections in Sonora but is widespread elsewhere in Mexico. *Ipomoea alba*, with two records, is common elsewhere and may or may not be native in Sonora. *Ipomoea ancisa* is a relatively narrow endemic in mountains in eastern Sonora and western Chihuahua but is locally common. *Jacquemontia abutiloides* is widespread in Baja California (norte) and Gulf of California islands and approaches Sonora on Isla Tiburón, although a thorough taxonomic investigation may render it a synonym of a mainland species. *Merremia cissoides*, with a single Sonora collection, is a cosmopolitan species.

**Non-natives.**—About eight convolvulids found in Sonora are not native to the state. *Convolvulus arvensis* and *I. xleucantha* are widespread weeds. *Ipomoea carnea* subsp. *fistulosa*, *I. triloba*, and *Merremia dissecta* are prob-

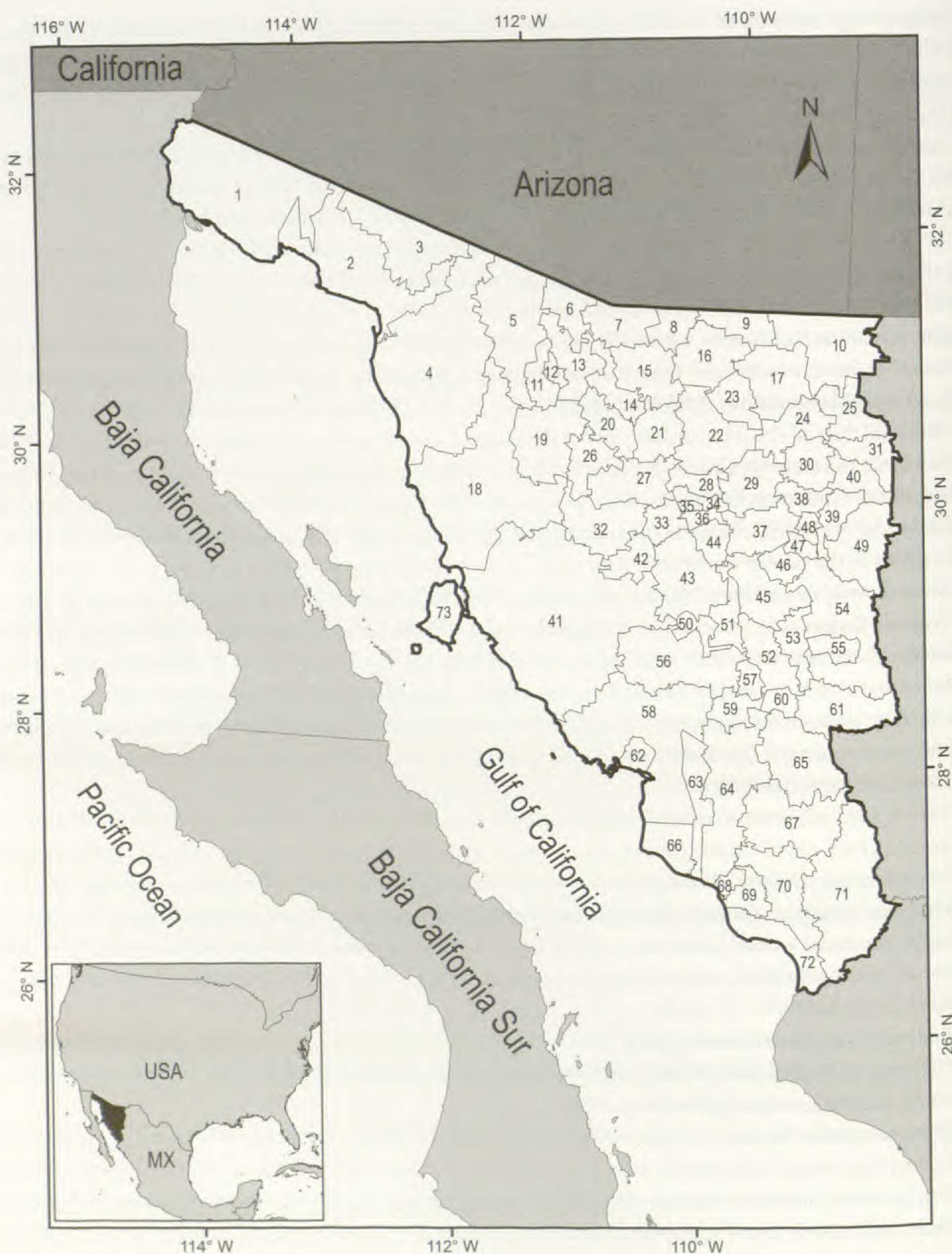


FIG. 1. Sonora showing the 72 municipios and Isla Tiburón (73). Drafted by Pedro P. Garcillán, based on the digital map of states and municipios of Mexico by Instituto Nacional de Estadística y Geografía (INEGI), [www.inegi.org.mx](http://www.inegi.org.mx) (2012).

**NUMERICAL LIST:** 1 San Luis Río Colorado. 2 Puerto Peñasco. 3 General Plutarco Elías Calles. 4 Caborca. 5 Altar. 6 Sáric. 7 Nogales. 8 Santa Cruz. 9 Naco. 10 Agua Prieta. 11 Oquitoa. 12 Átil. 13 Tubutama. 14 Magdalena. 15 Ímuris. 16 Cananea. 17 Fronteras. 18 Pitiquito. 19 Trincheras. 20 Santa Ana. 21 Cucurpe. 22 Arizpe. 23 Bacoachi. 24 Nacozari de García. 25 Bavispe. 26 Benjamín Hill. 27 Opodepe. 28 Banámichi. 29 Cumpas. 30 Villa Hidalgo. 31 Bacerac. 32 Carbó. 33 Rayón. 34 Huépac. 35 San Felipe de Jesús. 36 Aconchi. 37 Moctezuma. 38 Huásabas. 39 Bacadéhuachi. 40 Huachinera. 41 Hermosillo. 42 San Miguel de Horcasitas. 43 Ures. 44 Baviácora. 45 San Pedro de la Cueva. 46 Tepache. 47 Divisaderos. 48 Granados. 49 Nácori Chico. 50 Mazatán. 51 Villa Pesqueira. 52 Soyopa. 53 Bacanora. 54 Sahuaripa. 55 Arivechi. 56 La Colorada. 57 San Javier. 58 Guaymas. 59 Suaqui Grande. 60 Ónavas. 61 Yécora. 62 Empalme. 63 Bácum. 64 Cajeme. 65 Rosario. 66 San Ignacio Río Muerto. 67 Quiriego. 68 Benito Juárez. 69 Etchojoa. 70 Navojoa. 71 Álamos. 72 Huatabampo. (Continued on next page.)

ably of Caribbean origin and *I. batatas*, the sweet potato, is of tropical American origin. The origin of *I. heptaphylla* is not known although it is probably native to the Old World. *Ipomoea batatas* and *I. carnea* subsp. *fistulosa* are cultivated and are sometimes encountered outside of cultivation. *Cuscuta campestris* and *C. indecora* are weedy and probably have been introduced, and *C. tinctoria* probably is also not native to the flora.

**Diversity.**—In comparison with neighboring areas to the north and west (Arizona, the two Baja California states, California, and New Mexico), the convolvulaceae are quite diverse in Sonora. This is due to the more tropical affinities of much of the Sonoran flora as well as habitat diversity. As one moves further south in Mexico and Central America, the convolvulaceae diversity continues to increase. A comparison of the convolvulaceae diversity in Sonora with adjacent and comparable areas in Mexico and the southwestern United States is shown in Table 1.

### Vegetation of Sonora and the Convolvulaceae

The major habitats or vegetation types in Sonora include mangroves and coastal vegetation, tropical deciduous forest, thornscrub, desertscrub (both Sonoran and Chihuahuan), grassland, oak woodland, pine-oak forest, and mixed conifer forest (Fig. 2, Table 2). The Sonoran convolvulaceae are distributed as follows: Chihuahuan desert (11), Sonoran desert (33), coastal thornscrub (30), foothills thornscrub (31), tropical deciduous forest (41), grassland (13), oak woodland (34), pine-oak forest, 27), mixed conifer forest (1), salt scrub (1), mangroves (1). These vegetation regions are briefly mentioned below, with some examples of characteristic convolvulaceae. For discussions of the vegetation of Sonora the reader is referred to Brown (1982), Felger et al. (2001), Gentry (1942), Martin et al. (1998), Martínez-Yrizar et al. (2010), Rzedowski (1978), and Shreve (1951).

**Coastal vegetation.**—Mangroves occur sporadically along the coastal fringe of the southern two-thirds of the state, bordering salt scrub. *Cressa truxillensis* occurs along beaches and extends into tidal marshes (locally called *esteros*) of salt scrub and sometimes at the inland border of mangroves, as well as inland in some agricultural areas. *Ipomoea imperati* and *I. pes-caprae* are found along beaches.

**Chihuahuan desert.**—The northwestern corner of the Chihuahuan desert extends into limited areas of northeastern Sonora and adjacent southeastern Arizona at elevations below about 1430 m. This landlocked desert covers much of north-central Mexico between the Sierra Madre Occidental and Sierra Madre Oriental and extends into adjacent inland areas of the southwestern United States. Hard freezes may occur in the Chihuahuan desert, which accounts for the absence of columnar cacti and reduced convolvulaceae diversity. Rainfall mostly occurs during the summer. The Sonoran portion of the Chihuahuan desert is bordered by grassland and oak woodland. As with the Sonoran desert, there is open ground, and shrubs predominate. The substrate often consists of limestone and alkaline soils. A total of 12 convolvulaceae species are recorded for the relatively small area of the Chihuahuan desert in Sonora (one occurs adjacent in Arizona) and all except *Ipomoea cardiophylla* also occur in adjacent vegetation.

**Sonoran desert.**—The Sonoran desert, defined and described elegantly by Forrest Shreve (1951), covers roughly the northwestern two-thirds of Sonora. Shreve divided the Sonoran desert into seven geographic vegetation zones, five of which occur in Sonora, although Shreve's Foothills of Sonora is reclassified as thornscrub (Felger & Lowe 1976), leaving the Plains of Sonora, portions of the Arizona Upland, the Sonora portions of the Central Gulf Coast, and the Lower Colorado Valley. Within the span of environments in the Sonora portion of the Sonoran desert there is great variation in vegetation cover and structure and regional plant diversity. Thirty-two convolvulaceae species are documented for the Sonora portion of the Sonoran desert.

**ALPHABETICAL LIST:** Aconchi 36, Agua Prieta 10, Álamos 71, Altar 5, Arivechi 55, Arizpe 22, Átil 12, Bacadéhuachi 39, Bacanora 53, Bacerac 31, Bacoachi 23, BÁCUM 63, Banámichi 28, Baviácora 44, Bavispe 25, Benito Juárez 68, Benjamín Hill 26, Caborca 4, Cajeme 64, Cananea 16, Carbó 32, Cucurpe 21, Cumpas 29, Divisaderos 47, Empalme 62, Etchojoa 69, Fronteras 17, General Plutarco Elías Calles 3, Granados 48, Guaymas 58, Hermosillo 41, Huachinera 40, Huásabas 38, Huatabampo 72, Huépac 34, Ímuris 15, La Colorada 56, Magdalena 14, Mazatán 50, Moctezuma 37, Naco 9, Nácori Chico 49, Nacozari de García 24, Navojoa 70, Nogales 7, Ónavas 60, Opodepe 27, Oquitoa 11, Pitiquito 18, Puerto Peñasco 2, Quiriego 67, Rayón 33, Rosario 65, Sahuaripa 54, San Felipe de Jesús 35, San Ignacio Río Muerto 66, San Javier 57, San Luis Río Colorado 1, San Miguel de Horcasitas 42, San Pedro de la Cueva 45, Santa Ana 20, Santa Cruz 8, Sáric 6, Soyopa 52, Suaqui Grande 59, Tepache 46, Trincheras 19, Tubutama 13, Ures 43, Villa Hidalgo 30, Villa Pesqueira 51, Yécora 61.

TABLE 1. Comparative diversity of Convolvulaceae species in Sonora and other region in Mexico and southwestern United States.

	Sonora	Arizona	New Mexico	California	Baja California (norte)	Baja California Sur <sup>1</sup>	Bajío, Mexico <sup>2</sup>	Veracruz, Mexico	Nicaragua	Costa Rica	USA	Mexico
Total sp.	84	48	47	40	25	48	89	85 (w/o <i>Cuscuta</i> )	81-85	90	108	ca. 220
<i>Ipomoea</i>	41	16	14	0	3	24	50	55	43-47	52	46	ca. 151
<i>Cuscuta</i>	21	18	22	19	12	12	15	11	3-5	6	55	ca. 60
Sources		Austin 1991, Costea & Nesom in prep.	Austin 1990a, Allred 2011, Costea & Nesom in prep.	Austin 2012, Costea & Stefanović 2012	Costea unpubl., Rebman unpubl.	Costea unpubl. Rebman unpubl.	Carranza 2008	McDonald 1993b, 1994, Costea unpubl.	Austin 2001, Beliz 2001	Hammel 2010	Austin et al. in prep.	McDonald 1991, pers. comm. June 2012; Carranza 2008, Costea unpubl.

<sup>1</sup>Total species = 64 for the peninsula (both states); 20 species for *Cuscuta*; 24 for *Ipomoea* (Jon Rebman, personal communication 2011).<sup>2</sup>Including Guanajuato, Querétaro, and northern Michoacán.

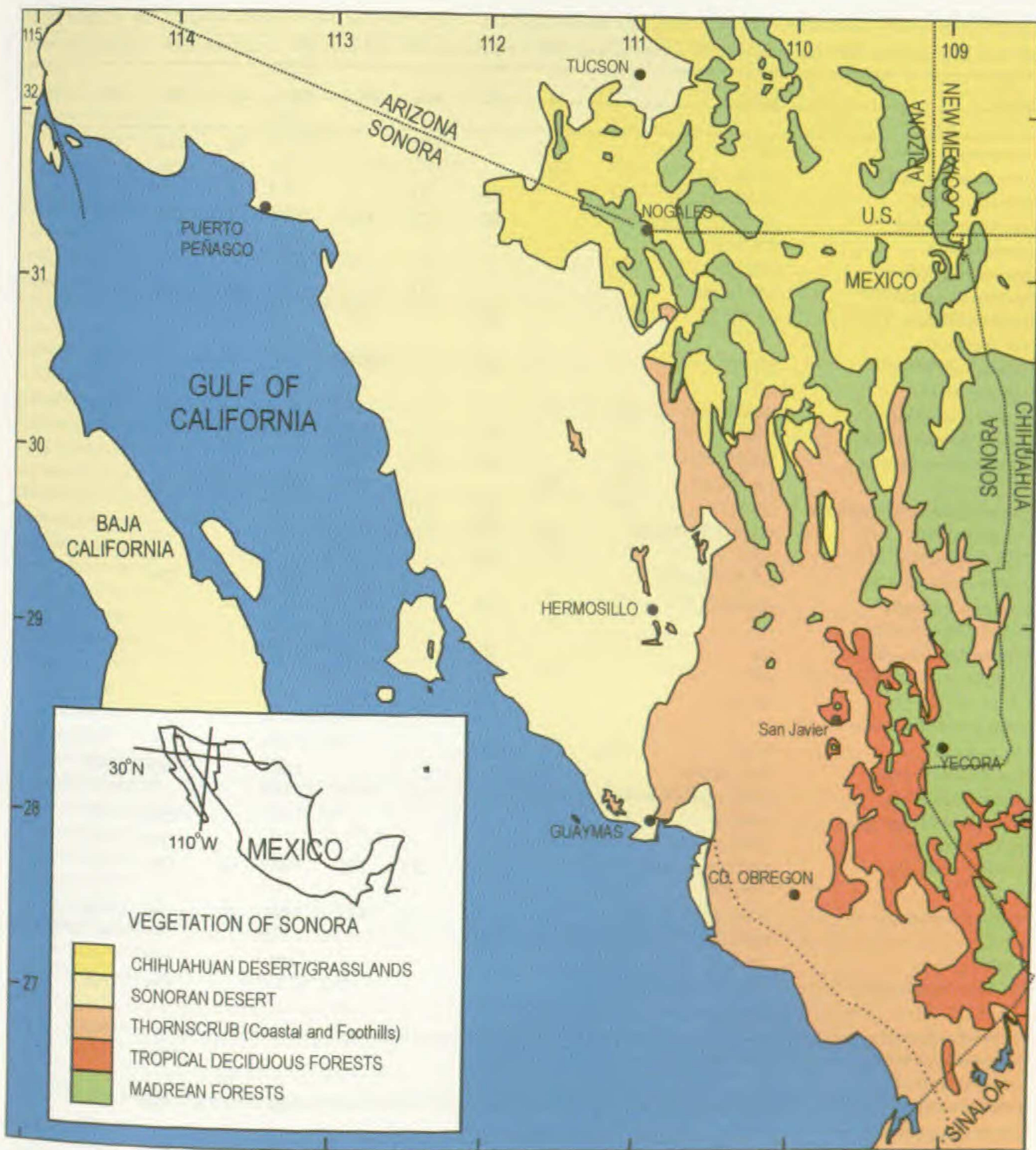


FIG. 2. Potential vegetation of Sonora. The dotted line in thornscrub indicates an approximation of coastal thornscrub to the west and foothills thornscrub to the east, Madrean forests include oak woodlands at lower elevations and pine-oak forest at higher elevations, and small areas of mixed conifer forests at highest elevations. Substantial areas of the original vegetation has been urbanized or converted to agriculture or modified for cattle grazing, especially in the coastal thornscrub and portions of Sonoran Desert. Map drafted by Alberto Búrquez (modified from Felger et al. 2001 and Martínez-Yrizar et al. 2010).

Unlike thornscrub there is much open ground. Most of the perennial Sonoran desert plants have evolved from tropical or subtropical relatives that are found today in thornscrub and tropical deciduous forest. Many of the perennials are sensitive to winter freezing, their northern limits fixed by an invisible line of freezing temperatures and drought. The desert is essentially frost-free at its southern limits, such as near Guaymas, and the severity and duration of freezing increases northward. Similarly, drought is more severe northward and westward (Felger 2000; Turner et al. 1995).

TABLE 2. Sonoran convolvulids, habitats. **CD** = Chihuahuan desert, **SD** = Sonoran desert, **CTS** = coastal thornscrub, **FTS** = foothills thornscrub, **TDF** = tropical deciduous forest. **GL** = grassland, **OW** = oak woodland, **POF** = pine-oak forest, **MSL** = miscellaneous: **SS** = salt scrub, **MG** = mangroves, **MCF** = mixed conifer forest.

Species	Habitat	CD	SD	CTS	FTS	TDF	GL	OW	POF	MSL
<i>*Convolvulus arvensis</i>	SD	CD		CTS			GL	OW	POF	
<i>Convolvulus equitans</i>	CD GL OW	CD					GL	OW		
<i>Cressa truxillensis</i>	SS MG SD CTS		SD	CTS						SS MG
<i>Cuscuta americana</i>	SD CTS FTS TDF OW		SD	CTS	FTS	TDF		OW		
<i>Cuscuta azteca</i>	TDF POF					TDF			POF	
<i>Cuscuta boldinghii</i>	CTS TDF			CTS		TDF				
<i>Cuscuta campestris</i>	CTS GL OW			CTS			GL	OW		
<i>Cuscuta chinensis</i> var. <i>applanata</i>	SD TDF GL		SD		TDF		GL			
<i>Cuscuta corymbosa</i> var. <i>grandiflora</i>	SD FTS		SD		FTS					
<i>Cuscuta costaricensis</i>	OW POF							OW	POF	
<i>Cuscuta dentatasquama</i>	POF								POF	
<i>Cuscuta desmouliniana</i>	SD CTS FTS		SD	CTS	FTS					
<i>Cuscuta erosa</i>	CD FTS TDF	CD			FTS	TDF				
<i>Cuscuta indecora</i> var. <i>indecora</i>	SD CTS		SD	CTS						
<i>Cuscuta legitima</i>	CD SD CTS FTS TDF	CD	SD	CTS	FTS	TDF				
<i>Cuscuta leptantha</i>	SD		SD							
<i>Cuscuta macrocephala</i>	FTS TDF GL OW				FTS	TDF	GL	OW		
<i>Cuscuta odontolepis</i>	SD FTS GL		SD		FTS		GL			
<i>Cuscuta polyanthemus</i>	FTS				FTS					
<i>Cuscuta salina</i> var. <i>salina</i>	SD		SD							
<i>*Cuscuta tinctoria</i> var. <i>tinctoria</i>	SD		SD							
<i>Cuscuta tuberculata</i>	SD FTS		SD		FTS					
<i>Cuscuta umbellata</i> var. <i>umbellata</i>	SD		SD							
<i>Cuscuta vandevederi</i>	TDF OW POF					TDF		OW	POF	
<i>Dichondra argentea</i>	CD in adjacent Arizona	CD								
<i>Dichondra brachypoda</i>	OW POF							OW	POF	
<i>Dichondra sericea</i>	OW POF							OW	POF	
<i>Evolvulus alsinoides</i>	SD CTS FTS TDF GL OW POF		SD	CTS	FTS	TDF	GL	OW	POF	
<i>Evolvulus arizonicus</i>	SD GL FTS TDF OW POF		SD		FTS	TDF	GL	OW	POF	
<i>Evolvulus filipes</i>	TDF OW					TDF		OW		
<i>Evolvulus nuttallianus</i>	OW POF in adjacent Arizona							OW	POF	
<i>Evolvulus prostratus</i>	POF								POF	
<i>Evolvulus rotundifolius</i>	OW POF MCF							OW	POF	MCF
<i>Evolvulus sericeus</i>	GL						GL			
<i>Ipomoea alba</i>	TDF OW					TDF		OW		
<i>Ipomoea ampullacea</i>	POF								POF	
<i>Ipomoea ancisa</i>	OW POF							OW	POF	
<i>Ipomoea arborescens</i> var. <i>arborescens</i>	SD CTS FTS TDF OW		SD	CTS	FTS	TDF		OW		
<i>Ipomoea arborescens</i> var. <i>pachylutea</i>	TDF OW POF					TDF		OW	POF	
<i>Ipomoea aristolochiifolia</i>	CD TDF OW	CD				TDF		OW		
<i>Ipomoea barbatisepala</i>	FTS TDF GL OW				FTS	TDF	GL	OW		
<i>Ipomoea batatas</i>	SD CTS FTS TDF		SD	CTS	FTS	TDF				
<i>Ipomoea bracteata</i>	CTS FTS TDF OW			CTS	FTS	TDF		OW		
<i>*Ipomoea cairica</i>	TDF					TDF				
<i>Ipomoea capillacea</i>	OW POF							OW	POF	
<i>Ipomoea cardiophylla</i>	CD in adjacent Arizona	CD								
<i>*Ipomoea carnea</i> ssp. <i>fistulosa</i>	CTS TDF			CTS		TDF				
<i>Ipomoea chilopsidis</i>	OW							OW		
<i>Ipomoea costellata</i>	CD SD GL CTS FTS TDF OW POF	CD	SD	CTS	FTS	TDF	GL	OW	POF	
<i>Ipomoea cristulata</i>		CD	SD	CTS	FTS	TDF	GL	OW	POF	



TABLE 2. continued

Species	Habitat	CD	SD	CTS	FTS	TDF	GL	OW	POF	MSL
<i>Ipomoea decasperma</i>	POF								POF	
<i>Ipomoea hederacea</i>	SD TDF GL		SD			TDF	GL			
<i>Ipomoea hederifolia</i>	(SD) CTS FTS TDF OW POF		SD	CTS	FTS	TDF		OW	POF	
<i>Ipomoea heptaphylla</i>	CTS			CTS						
<i>Ipomoea imperati</i>	CTS			CTS						
<i>Ipomoea laeta</i>	POF								POF	
* <i>Ipomoea xleucantha</i>	CTS FTS TDF			CTS	FTS	TDF				
<i>Ipomoea longifolia</i>	FTS TDF GL OW				FTS	TDF	GL	OW		
<i>Ipomoea madrensis</i>	OW POF							OW	POF	
<i>Ipomoea meyeri</i>	TDF					TDF				
<i>Ipomoea minutiflora</i>	FTS TDF OW POF				FTS	TDF		OW	POF	
<i>Ipomoea muricata</i>	TDF					TDF				
<i>Ipomoea nil</i>	SD CTS TDF		SD	CTS		TDF				
<i>Ipomoea parasitica</i>	CD FTS TDF OW	CD			FTS	TDF		OW		
<i>Ipomoea pedicellaris</i>	CTS FTS TDF			CTS	FTS	TDF				
<i>Ipomoea pes-caprae</i>	CTS		SD	CTS						
<i>Ipomoea plummerae</i>	CTS POF			CTS					POF	
<i>Ipomoea pubescens</i>	OW POF							OW	POF	
<i>Ipomoea purpurea</i>	SD TDF OW		SD			TDF		OW		
<i>Ipomoea quamoclit</i>	TDF					TDF				
<i>Ipomoea scopulorum</i>	SD CTS FTS TDF		SD	CTS	FTS	TDF				
<i>Ipomoea seaania</i>	SD		SD							
<i>Ipomoea tenuiloba</i>	OW POF							OW	POF	
<i>Ipomoea ternifolia</i> var. <i>leptotoma</i>	SD CD FTS TDF GL OW	CD	SD		FTS	TDF	GL	OW		
<i>Ipomoea thurberi</i>	GL OW POF						GL	OW	POF	
<i>Ipomoea triloba</i>	SD CTS TDF		SD	CTS		TDF				
<i>Jacquemontia abutiloides</i>	SD		SD							
<i>Jacquemontia agrestis</i>	SD CTS FTS TDF		SD	CTS	FTS	TDF				
<i>Jacquemontia polyantha</i>	SD CTS TDF		SD	CTS		TDF				
<i>Jacquemontia pringlei</i>	CD SD CTS FTS TDF	CD	SD	CTS	FTS	TDF				
<i>Merremia cissoides</i>	TDF					TDF				
* <i>Merremia dissecta</i>	TDF					TDF				
<i>Merremia palmeri</i>	SD CTS FTS TDF		SD	CTS	FTS	TDF				
<i>Merremia quinquefolia</i>	TDF					TDF				
<i>Operculina pinnatifida</i>	CTS FTS			CTS	FTS					
<i>Operculina pteripes</i>	FTS TDF OW				FTS	TDF		OW		
<b>Totals</b>		11	33	30	31	44	13	34	27	2

The tree morning glory, *Ipomoea arborescens*, extends into the limited areas of the southern portion of the Sonoran desert (north of Hermosillo) and the narrow endemic *I. seaania* occurs at the desert edge north of Guaymas. Several *Jacquemontia* species are semi-woody vines and are common in much of the semi-arid portions of the Sonoran desert. The remaining Sonoran desert convolvulaceae are herbaceous perennials and annuals, and are mostly found in active growth and reproduction with hot weather or summer rains.

Although convolvulaceae are well represented in the Sonoran desert, only 8 species occur in the flora of the extremely arid Gran Desierto of northwestern Sonora (Felger 2000). Five of these, *Cuscuta legitima*, *C. tuberculata*, *C. umbellata*, *Evolvulus alsinoides*, and *Ipomoea hederacea*, range into the actual desert, the others generally occurring as weeds in irrigated fields or in coastal wetlands (*Cressa*). In contrast, the Central Gulf Coast of Sonora subdivision (sensu Shreve 1951) of the Sonoran desert, the southernmost region of the desert in Sonora, supports at least 26 convolvulaceae species in seven genera. Included among these are the unusual narrow endemic *Ipomoea seaania* and at least eight species of *Cuscuta*.

**Thornscrub.**—Thornscrub in Mexico is essentially a drier version of tropical deciduous forest (TDF) and in Sonora intermediate between the Sonoran desert and TDF. The boundaries are fuzzy. Like TDF, the plants

show a strong seasonality linked with monsoonal rains and for the most part are highly frost-sensitive. Unlike TDF, natural thornscrub generally does not form 100% perennial coverage. The stature of the vegetation is generally lower and the dominant species tend to have smaller leaves than those of the TDF. Thornscrub in Sonora was described as Sinaloan Thornscrub by Brown (1982) and Thorn Forest by Gentry (1942).

Two thornscrub formations can be discerned in Sonora: the coastal thornscrub (CTS) of southwestern Sonora (Felger and Lowe 1976; Friedman 1996; Martin et al. 1998) and the interior, foothills thornscrub (FTS) along the east side of the Sonoran desert and at higher elevations within the Sonoran desert. We document 30 convolv species in CTS in Sonora and 31 in FTS.

Coastal thornscrub is on the coastal plain from Empalme-Guaymas southward. Foothills thornscrub is on inland, often rocky slopes. In southern Sonora, FTS is below tropical deciduous forest in elevation. In central Sonora, it is the transitional vegetation between the Plains of Sonora subdivision of the Sonoran desert on the west and oak woodland in Sky Island mountain ranges and the Sierra Madre Occidental to the east. In the north FTS is replaced by desert grassland as winters become colder and periodic fires become ecological processes. The northern limits of FTS in Sonora are at about 30°11'N in the Río Sonora Valley and 30°26'N on the Río Bavispe at the southern end of the Sierra El Tigre. FTS does not reach Arizona, but the distributions of a number of FTS species extend into southern Arizona in desert grassland or oak woodland.

**Coastal thornscrub** extends southward on the coastal plain from the southern margin of the Sonoran desert in the vicinity of Guaymas into coastal northwestern Sinaloa. Southward and eastward this vegetation type merges with TDF. Much of the coastal thornscrub has been converted to large-scale modern agriculture.

**Foothills thornscrub.**—This vegetation type is essentially synonymous with Shreve's (1951) Foothills of Sonora subdivision of the Sonoran desert (Felger and Lowe 1976; Felger et al. 2001). FTS is shrubby or semi-arborescent vegetation with a nearly closed canopy of small trees and large shrubs. FTS extends northward along the eastern side of the Sonoran desert, becoming narrower in geographic and elevational range towards its northern limits. Northward it gives out at about the vicinity of Arizpe, where rise in elevations and winter freezing as well as drier conditions become pronounced.

**Tropical deciduous forest.**—The northern arm of TDF, sweeping northward from the tropics, ends in the mountains of eastern Sonora and southwestern Chihuahua. Sonoran TDF is sandwiched between thornscrub to the west at lower elevations and oak woodland eastward at higher elevations. Northward, along the east side of the Sonoran desert, TDF merges into foothills thornscrub (Felger et al. 2001; Martínez-Yrizar et al. 2010).

There is a long dry season interrupted by a short but intense rainy season generally from mid-June to October. Summers are long and hot and winters short and mild. Freezing weather is rare and most Sonoran TDF species are highly frost-sensitive. Awesome and seemingly sudden transformation to luxuriant tropical green occurs with the onset of the summer monsoon. TDF, with 44 documented species, supports a greater convolv species richness than any other vegetation in the state. The tree morning glory, *Ipomoea arborescens* is a common and conspicuous component, as are others such as *Ipomoea bracteata* with its spectacular pink inflorescences. *Ipomoea muricata*, *I. quamoclit*, *Merremia cissoides* (with one record), *M. dissecta*, and *M. quinquefolia* are more or less restricted to TDF.

**Grasslands.**—The southwestern extension of the Great Plains grassland biome in the mid-continent is in the southwestern United States and northwestern Mexico. The best developed regional grasslands with more rainfall and colder winter temperatures termed Plains Grassland are restricted to the Animas and San Rafael Valleys along the Arizona-Sonora border. Most other areas are termed desert grassland (McClaran & Van Devender 1995), with warmer, drier climates. Dominant or common species in the regional desert grassland have fluctuated four times during the last 4,000 years—between bunch grasses during wetter periods and shrubs such as mesquites (*Prosopis glandulosa*, *P. velutina*) and others during drier periods (Van Devender 1995). Today desert grassland controlled by human disturbance related to cattle grazing is widespread in valley lowlands below oak woodland from northeastern Sonora west to the Sásabe area southeast of the Baboquivari Mountains and south to the Cananea-Fronteras area within 100 km of the Arizona border.

In southeastern Arizona and northeastern Sonora, valley bottom desert grassland forms a mosaic with Chihuahuan Desert on rocky limestone slopes. To the west, Sonoran desert borders desert grassland at its lower elevations. To the south, desert grassland is replaced by foothills thornscrub below oak woodland, although there are local areas of grassland still present. In addition, there are open grassy areas within oak woodland and pine-oak forest in the higher Sky Island mountain ranges and the Sierra Madre Occidental. As freezes decrease southward, foothills thornscrub replaces desert grassland. Only 13 convolv species are documented from grasslands in Sonora. Characteristic species include *Ipomoea longifolia*, a large herbaceous perennial often conspicuous sprawling across expanses of short grasses, and *Evolvulus sericeus*, a small, silvery-leaved herbaceous perennial.

**Oak woodland.**—Oak woodland is widely distributed at elevations above desert, grassland, thornscrub, and tropical deciduous forest, but below pine-oak woodland. In Sonora, 34 convolv species occur in OW. Across Sonora, and northern Mexico, the species composition and density of oak woodland changes both with elevation and from south to north. Although these oak zones have been called Madrean Evergreen Woodland (Brown 1982), many Sonoran oaks and associated species are deciduous during the late spring drought, and their biggest flush of new foliage occurs with the renewal of summer rains. In these regions “autumn color” occurs in late spring as the air and ground desiccate and temperatures soar.

Extensive areas in northeast and north-central Sonora are dominated by open woodland of *Quercus emoryi*. This species, with *Q. oblongifolia* and *Q. arizonica*, are among the most common low-elevation oaks in the northern part of the state. At lower elevations the oaks border desert grassland, foothills thornscrub, and desertscrub. There is sometimes a broad ecotone between oak woodland and grassland where the oak trees become widely spaced and grasses predominate. Oak woodland sometimes occurs on acidic, hydrothermally altered soils within tropical deciduous forest where the ecotone between the two plant communities is often only a few meters wide.

Oak woodland in southeastern Sonora, called Oak Forest by Gentry (1942), shows considerable tropical affinity. The lower limits border tropical deciduous forest, and the boundaries are often remarkably well defined, apparently maintained by fire. Fire, however, is not an ecological process in desertscrub, thornscrub, or tropical deciduous forest. Across mountains in the Río Mayo and Río Fuerte drainages, low fires creeping almost harmlessly through dry grasses and forbs among the leafless oaks used to be a common sight in May and June. These fires destroy small TDF trees and shrubs but not the perennial grasses, forbs, and oaks. Many of the oaks in east-central and southeastern Sonora and nearby southwestern Chihuahua are tropical montane oaks. *Ipomoea chilopsidis* is the most spectacular and unique convolv among the diverse 34 convolv species in oak woodland.

**Pine-oak forest.**—There are numerous montane islands of pine-oak forest in the mountains of eastern Sonora. However, pine-oak forest is more extensive east of Sonora in Chihuahua along the east side of the continental divide. In comparison, on the western slope of the Sierra Madre Occidental the climate is generally somewhat wetter, with presumably milder winter temperatures, resulting in a more diverse flora with more tropical-derived pines such as *Pinus engelmannii*, *P. herrerae*, *P. oocarpa*, and a number of tropical-montane oaks such as *Q. tarahumara*. The pine-oak forest has been included within the concept of Madrean Evergreen Woodland and Madrean Montane Conifer Forest (Brown 1982; Martin et al. 1998). Towards southeastern Sonora the pine-oak woodland is floristically and structurally more like Mexican pine-oak woodland than the temperate pine-oak woodland to the north. Pine-oak forest, where the pines form the overstory while the oaks generally form an understory, is continuous with oak woodland at lower elevations. Among the 27 convolv species in POF, *Cuscuta dentatasquama* (the type collection is the only Sonora record), *Ipomoea ampullacea* (one record, see the species accounts), and *Ipomoea decasperma* (one record) appear to be restricted to this habitat.

**Mixed conifer forest.**—This zone is restricted to limited areas on the several highest mountain tops in northeastern Sonora and very limited areas near Yécora, in the upper Río Mayo drainage. Three conifers, *Abies*, *Pinus*, especially *P. strobiformis*, and *Pseudotsuga*, define this vegetation. *Evolvulus rotundifolius* is the only convolv recorded in mixed conifer forest in Sonora.

## CONVOLVULACEAE JUSSIEU – MORNING GLORY FAMILY

**Twining herbs, lianas, subshrubs, shrubs, or trees**, some species with milky sap. Rootstocks sometimes tuberous, otherwise fibrous. **Leaves** alternate, usually simple, entire to pinnately lobed or pectinate, some species palmately compound; stipules absent. **Inflorescences** solitary in leaf axils or in racemose or paniculate cymes, some dichasial basally and monochasial above. **Flowers** small and inconspicuous to large and showy, but usually wilting quickly after opening (mostly within 4–5 hours) except *Cuscuta* and often excepting plants flowering during cooler weather, bisexual (or unisexual in some African species), actinomorphic or slightly irregular. Sepals 5, distinct, imbricate, equal or unequal, persistent, occasionally accrescent. Corollas sympetalous, tubular, funnellform, campanulate, urceolate, or salverform, 5-lobed, 5-toothed, or  $\pm$  entire, with plicae (areas folded in bud) and interplicae (unfolded in bud), usually induplicate and often also convolute in bud. Nectary disc annular or cup-shaped, sometimes 5-lobed, occasionally absent. Stamens 5, distinct; filaments inserted on the corolla tube base alternate with corolla lobes; anthers dithecal, usually linear or oblong, extrorse or introrse. Ovary superior, 2–4(–6)-carpellate, usually with as many cells, placentation basal or basal-axile, ovules 2 (4–6) per cell, or ovary 1-celled and ovules 4, these erect, anatropous; style 1, filiform, simple or bifid, or sometimes with 2 distinct styles; stigmas capitate or bilobed, or, when stigmas 2, then linear, ellipsoid, or globose. **Fruits** capsular, dehiscent by valves, transversely or irregularly, or indehiscent and baccate or nut-like. Seeds 1–4(–6; to 10 in *Ipomoea decaspema*), often fewer than ovules, glabrous or pubescent, endosperm absent or scanty, cartilaginous; cotyledons usually foliaceous.

Genera 58, species estimated 1880 (Staples 2011), cosmopolitan; genera 9, species about 84 in Sonora.

## SPECIES ACCOUNTS

Brief descriptions of the habit and distinguishing or noteworthy characteristics are provided for species and infraspecific taxa. The months or seasons noted refer to the recorded times of reproduction. Flowering and fruiting usually overlap broadly, and therefore we generally do not distinguish separate flowering and fruiting times. Many species that are reproductive at various seasons do so facultatively, mostly depending on soil moisture and temperature. There is, however, a marked tendency for members of the family to have flowering initiated by short day length and thus they usually flower in the autumn.

Representative specimens are cited in the last paragraph of each species or infraspecific taxon account. We include the Sonora *municipios* (mpio.), as of 2011, to help place the collection localities (Fig. 1). We also include records from Gulf of California islands nearest the Sonora coast (Islas Tiburón, Alcatraz in Bahía Kino, Dátil, San Esteban, and San Pedro Nolasco; see Felger and Wilder 2012, Felger et al. 2011). We have seen all specimens (except those specified as “not seen”) and use “!” for all specimens or images that we have seen, except in *Cuscuta* where “!” is used for the types seen. All *Cuscuta* specimens cited have been seen by Costea. All other convolvulids have been seen by Austin and/or Felger.

Unless otherwise indicated, specimens cited are deposited at the University of Arizona Herbarium (ARIZ); specimens in other herbaria are indicated by the abbreviations given in Thiers (2011). Most of our collections are duplicated in the herbaria of USON, MEXU, and SD and other regional and international collections. If a specimen is at ARIZ, we generally do not cite duplicates at other herbaria. When a specimen lacks a collection number, it is identified by the date if available to us, for example: *Ezcurra* 9 Nov 1982. We generally abridge label information, but provide enough that one can find the specimen at a herbarium or search additional information in a data base, especially SEINet (Southwest Environmental Information Network 2012) and MABA (Madrean Archipelago Biodiversity Assessment 2012). Usually only the first collector's name is listed. Elevations and reproductive times (flowers and fruiting) are mostly from herbarium label data and are specific only for Sonora. Coordinates for specimens cited are often available in SEINet (Southwest Environmental Information Network 2012), however these might not have come from the collectors' labels. Many coordinates were added/determined by students entering information by looking on Google Earth, or other maps and some may be inaccurate (especially for specimens from Mexico). Coordinates for many specimens cited are not repeated here to save space. North America is defined here as Mexico northward, excluding Central

America. Hundreds of photographs that illustrate diagnostic details of morphology for the majority of species, are provided on a companion website—Convolvulaceae (morning glories) of Sonora, Mexico, which is hosted at ARIZ and WLU (Costea et al. 2012b). Plants not native to flora area are marked with an asterisk (\*).

### TYPIFICATIONS

Special attention has been given to study of type specimens for the taxa included, not only to assure the correct names but also for proper identification. These data are included because there have been errors in citing types in the literature. Types have been checked by consultation of protologues and corrected where necessary. Type sheets have been studied at various herbaria or as loans, and also from online databases at various herbaria, some through JSTOR Plants (2011). Moreover, because of the information now available, it is possible to note many more duplicates of type collections than previously known. The information provided here gives a more complete picture of the available resources for each taxon than formerly obtainable.

Problems and errors in typification are discussed in several cases. Some taxa have never had lectotypes selected. In several cases, we designate lectotypes to establish proper use of names and concepts. In other cases, various problems with former selections of types have been located and these are discussed and resolved except in the case of *E. alsinoides* var. *angustifolia*. Lectotypes are selected for nine species and new information and clarifications are provided for others: *Convolvulus palmatus* (in *Merremia dissecta*), *Convolvulus pennatus* (in *Ipomoea quamoclit*), *Cuscuta corymbosa* var. *grandiflora*, *Ipomoea ancisa*, *Ipomoea alata* (in *Operculina pteripes*), *I. alatipes* (in *Operculina pteripes*), *I. decasperma*, *I. pedicellaris*, *Merremia dissecta*, *Operculina pinnatifida*, *O. pteripes*, and *O. roseana* (in *Operculina pinnatifida*).

### KEY TO THE GENERA

1. Plants parasitic, lacking chlorophyll and without roots (except seedlings). Stems yellow or orange and notably slender and glabrous. Leaves absent or reduced to small scale-leaves \_\_\_\_\_ **Cuscuta**
1. Plants not parasitic; with roots, leaves, and chlorophyll. Stems not orange or yellow.
  2. Trees or shrubs at least 1 m tall with notably thick trunks and/or lower branches and stems. Corollas white, 4–9 cm wide. \_\_\_\_\_ **Ipomoea** (in part: the tree morning glories)
  2. Herbaceous annuals or perennials, or at least not substantial shrubs or trees.
    3. Stems, small, prostrate, sometimes mat-forming. Leaves reniform to cordate. Flowers usually <1 cm wide, corollas deeply lobed, greenish, yellowish to purple. Fruits utricles or capsules \_\_\_\_\_ **Dichondra**
    3. Stems mostly ascending to erect, rarely prostrate, not mat-forming. Flowers mostly  $\geq 1$  cm wide, corollas deeply to shallowly lobed, white, pink, lavender, purple or variously colored. Fruits capsules or indehiscent.
      4. Styles 2, free or united near the base.
        5. Plants often of saline regions. Herbs, much-branched, perennial, stems not vining. Leaves usually <1 cm long, sessile. Styles 2-lobed, the stigmas globose \_\_\_\_\_ **Cressa**
        5. Plants of hydric or xeric regions, rarely saline. Perennial or annual herbs or vines, lianas, or shrubs. Leaves mostly >1 cm long, petiolate or sessile. Styles divided into 4 lobes, the stigmas elongate to clavate \_\_\_\_\_ **Evolvulus**
      4. Styles 1, entire or with 2 inconspicuous branches hidden by the stigmas.
        6. Stems and leaves with stellate trichomes.
          7. Corollas 0.6–2.7 cm long. Stigmas ellipsoid to oblong. Fruits usually 8 or more valved \_\_\_\_\_ **Jacquemontia**
          7. Corollas 6–8 cm long. Stigmas globose. Fruits 4-valved \_\_\_\_\_ **Ipomoea scopulorum**
        6. Stems and leaves with or without trichomes, but not stellate. Stigmas linear to linear-subulate or globose. Fruits with 4–6 valves, or irregularly or transversely dehiscent, or indehiscent.
          8. Flowers campanulate, white or white limb with purple-red throat.
            9. Corolla white \_\_\_\_\_ **Operculina pinnatifida**
            9. Corolla white with red-purple throat \_\_\_\_\_ **Merremia dissecta**
          8. Flowers funnelform, salverform to funnelform-salverform, white or colored.
            10. Flowers white to pink. Stigmas subulate and cylindrical, apices acute \_\_\_\_\_ **Convolvulus**
            10. Flowers variously colored, from white through pink to purple, yellow or other colors. Stigmas globose.
              11. Stamens straight upon dehiscing. Pollen pantoporate, spinulose, the spinules visible with 10 $\times$  magnification \_\_\_\_\_ **Ipomoea**
              11. Stamens spirally twisted upon dehiscing. Pollen colpate, not spinulose.
                12. Corollas white or white with purple throat \_\_\_\_\_ **Merremia dissecta**
                12. Corollas reddish, red-orange, or salmon \_\_\_\_\_ **Operculina pteripes**

**Convolvulus** L., Sp. Pl. 153. 1753. [Latin *convolvere*, to entwine, in reference to the twining habit of these plants.]

Woody or herbaceous **vines** or **shrubs**. **Leaves** petiolate rarely sessile; blades herbaceous to coriaceous, linear to ovate or elliptic with subtruncate cordate, sagittate or hastate bases, glabrous or hairy, the margins usually undulate to crenate or irregularly lobed or lacinate. **Inflorescences** of solitary flowers or in cymose groups, on pedicels mostly 1–3 cm long, bracts and bracteoles linear, elliptic or ovate. **Flowers** small to medium (0.4–4 cm long in North America). Sepals subequal, the inner three often somewhat longer, suborbicular, elliptic to ovate, hairy or glabrous, obtuse to acute, usually mucronate. Corollas white or rose to purple or blue on the limb and white or purplish within the tube, funnellform, the limb 5-angulate to 5-lobed, the midpetaline (exposed areas between the corolla folds in the bud) bands glabrous or hairy. Stamens included, unequal, with glandular trichomes on the filament base, the anthers oblong, basally auriculate, introrse. Pollen 3-colpate. Disc usually lobed. Ovary 2-locular, 4-ovulate, ovoid to subglobose, glabrous or hairy. Style one; with 2 filiform, papillose stigmas. **Fruits** capsular, 4-valved, mostly brown, chartaceous, ovoid to conical-ovoid, glabrous or hairy. Seeds 1–4, trigonous or rounded, smooth or verrucose, black to dark brown, glabrous.

Species ca. 200 (many are found only in Europe and Asia). Three species are native to North America.

*Selected reference.*—Sa'ad (1967).

- |   |                    |
|---|--------------------|
| 1. Perennials from deep creeping roots. Stems forming large dense patches. Leaf blades almost as broad as long. Calyx 3–5 mm long _____   | <b>C. arvensis</b> |
| 1. Perennials from a taproot. Stems not forming large dense patches. Leaf blades usually much longer than broad. Calyx 6–12 mm long _____ | <b>C. equitans</b> |

\***Convolvulus arvensis** L., Sp. Pl. 153. 1753. TYPE: SWEDEN: Linnaeus (218.1 LINN!).

*Convolvulus ambigens* House, Bull. Torrey Bot. Club 32:139, 1905, TYPE: U.S.A. COLORADO: near Fort Collins, 22 Jun 1896, Crandall 4218 (HOLOTYPE: NY!, ISOTYPE: US!; 23 Aug 1898, Crandall 4218 (PARATYPES (2) NY!).

#### CORREHUELA; BINDWEED

Widely spreading rhizomatous perennial **herbs** with branched, decumbent or twining stems. **Leaves** variable, often ovate, ovate-lanceolate to elliptic, 1–10 cm long, 0.3–6 cm wide, entire or with the margin somewhat undulate, basally cordate to subtruncate, hastate or sagittate, the lobes obtuse or acute, entire or with 2 or 3 teeth, glabrous or inconspicuously puberulent; petioles 3–40 mm long. **Inflorescences** cymose, on peduncles 3–3.5 mm long; bracts elliptic, linear or obovate, 2–3(–9) mm long, the bracteoles linear, 2–4 mm. long, usually glabrous. **Flowers** 2 or 3, or solitary, the pedicels 5–18(–35) mm long, reflexed in fruit. Sepals slightly unequal, obtuse or less often truncate or emarginate, mucronate, ciliate; outer sepals elliptic, 3–4.5 mm long, 2–3 mm wide, glabrous or tomentose, the inner ones suborbicular to obovate, 3.5–5 mm long, 3–5 mm wide. Corollas 1.2–2.5 cm long, glabrous, campanulate, typically white or tinged with pink, sometimes becoming pink with age, or with white interplicae and pink plicae. **Capusules** subglobose to ovoid, 5–7 mm wide, glabrous. Seeds 1–4, 3–4 mm long, black to dark brown, glabrous, tuberculate.  $2n = 48, 50$ .

**Sonora.**—Widespread and weedy, especially in cultivated fields: Chihuahuan and Sonoran deserts, desert grassland, coastal thornscrub, oak woodland, and pine-oak forest; near sea level–2100 m. Flowering throughout the year, but specifically recorded in March–August.

**General distribution.**—A worldwide weed including cultivated fields, disturbed ground, roadsides; throughout most of southern Canada and USA; Baja California (norte) and Sur, Chihuahua, Distrito Federal, Guanajuato, Hidalgo, Edo. México, Michoacán, Querétaro, Sinaloa, Tamaulipas; naturalized from Europe.

This Old World weed is considered by some to be the worst in the world (Austin 2000a). Due to its deep rhizomatous growth, it persists and reappears even when above ground parts have been eliminated with herbicide. Together with *Cressa*, this is one of the few members of the family that develops rhizomes (Austin 2000a).

**Mpio. Agua Prieta:** 8.4 km S of Agua Prieta (at MEX 2) on SON 17 (to Fronteras), flowers white, open in afternoon, 16 Apr 2007, Reina-G. 2007-395! **Mpio. Cananea:** Cananea, 1545 m, flowers white, turning pink, 15 May 2002, Van Devender 2002-306 (USON!). **Mpio. Hermosillo:** 2 km W of Hermosillo, 29°05'N, 111°01'W, common scandent vine in disturbed field, flowers pink, 9 Aug 1995, Friedman 259-95! **Mpio. Guaymas:** 30 km NW of Pótam, coastal thornscrub, irrigated field, flowers white, 4 Mar 2006, Van Devender 2006-250! **Mpio. Huatabampo:** 5 km E of La Unión on Huatabampo road, common, flowers white, 14 Apr 1995, Van Devender 95-284! **Mpio. Yécora:** El Llano on Mesa del Campanero (W of Yécora), 28°20'30"N, 109°01'55"W, 2100 m, Trauba 23 Sep 1997 (FTG-FAU!).

**Convolvulus equitans** Benth., Pl. Hartweg. 16. 1839. TYPE: MEXICO. NUEVO LEÓN: 1837, *Hartweg 98* (HOLOTYPE: K!; ISOTYPES: G!, LD!, NY!).

*Convolvulus hermannioides* A. Gray, Syn. Fl. N. Amer. 2(1):216. 1878. TYPE: U.S.A. TEXAS: [without locality], *Lindheimer 469* (HOLOTYPE: GH!).

*Convolvulus incanus* sensu Kearney & Peebles, not Vahl (see also Staples et al. 2006).

Perennial **herbs** with branched, prostrate or decumbent stems arising from a taproot; densely hairy. **Leaves** variable, ovate-elliptic to triangular-lanceolate or narrowly oblong with projecting basal lobes, blades most often deeply indented basally, 1–7 cm long, 0.2–4 cm wide, densely hairy on both surfaces with loosely appressed indumentum, margins toothed or lobed or both, rarely entire; petioles 0.25–5 cm long. **Inflorescences** usually 1-flowered, less often 2 or 3 and cymose, on peduncles 0.5–10.5 cm long; bracts and bracteoles lanceolate, 1.5–3 mm long or sometimes scale-like, hairy like the leaves. **Flowers** often solitary, on short pedicels 5–24 mm long. Sepals oblong to ovate, 6–12 mm long, 3–6 mm wide, obtuse to weakly retuse apically, appressed sericeous, the margins membranaceous, subcordate with age. Corollas (1.5–) 2.5–3 cm long, campanulate, white or pink to pale lavender, at times with a reddish center, sericeous on the petal lobes. **Capsules** ± globose, 7–8 mm wide, glabrous. Seeds 1–4, 4–4.5 mm long, black, granulate, glabrous.  $n = 12$ .

**Sonora.**—Northeastern part of the state in Chihuahuan Desert, grassland, and oak-mesquite scrub; often in disturbed sites; 1200–1600 m. Flowering April–December.

**General distribution.**—California, Arizona, New Mexico, Texas; Chihuahua, Coahuila, Guanajuato, Hidalgo, Edo. México, Michoacán, Nuevo León, Oaxaca, Puebla, Querétaro, San Luis Potosí.

**Mpio Agua Prieta:** Rancho El Nogalito, Cuenca Los Ojos Foundation Conservation Area, 49.6 km (by air) E of Agua Prieta, 1476 m, 30 Sep 2009, *Reina 2009-1747!* **Mpio Cananea:** 4 km NE of Cananea on MEX 2, 21 May 2008, 1496 m, *Van Devender 2008-234-A!* **Mpio Santa Cruz:** Rancho Los Fresnos, upper San Pedro River drainage, along US–Mexico border, just SW of Huachuca Mountains, 15 Oct 2005, 1555 m, *Boyle 7751!*

**CRESSA** L., Sp. Pl. 223. 1753. [Greek, based on *kris* or *kriti*, “from Crete,” a Cretan woman; apparently not etymologically related to *cress* or *cressa* (Cruciferae) of Germanic derivation].

#### ALKALI WEED

Perennial **herbs** or **subshrubs**, gray appressed pilose to sericeous, usually much-branched, the stems erect to decumbent. **Leaves** sessile or short-petiolate, entire, small or scale-like. **Inflorescences** axillary, 1-flowered. **Flowers** appearing sessile or on short peduncles (at least some, e.g., *C. truxillensis*), bracteate, in spicate to head-like clusters at tips of branchlets, bracteoles unequal in length. Sepals ovate to obovate, imbricate. Corollas salverform, the limb 5-lobed, the lobes mostly ovate, imbricate, spreading to reflexed. Stamens and styles exserted; filaments filiform; pollen 3-colpate. Ovary 2-locular, 4-ovulate; styles 2, distinct to the base; stigmas capitate. **Fruit** capsular, ovoid, unilocular, 2–4-valved, usually 1-seeded. Seeds glabrous, smooth and shining to reticulate, dark brown.

Species 4, two in the Americas, one in Asia, and one in Australia.

*Selected reference.*—Austin (2000b).

**Cressa truxillensis** Kunth, Nov. Gen. Sp. (quarto ed.) 3:119. 1818 [1819]; also folio ed. 3:93. 1819. TYPE: PERU: Trujillo, *Humboldt & Bonpland 3727* (microfiche seen; photo F!, ISOTYPE: F!). *Cressa cretica* var. *truxillensis* (Kunth) Choisy in DC., Prodr. 9:440. 1845.

*Cressa australis* var. *petiolata* Meisn. in Mart., Fl. Bras. 7:329. 1869. TYPE: ARGENTINA: Buenos Aires, [date not given in protologue or in O'Donnell (1957)], *Tweedie* (HOLOTYPE: M, not seen).

*Cressa depressa* Goodd., Bot. Gaz. 37:58. 1904. TYPE: U.S.A. NEVADA: saline swampy ground, Virginia River, 6 May 1902, *Goodding 726* (HOLOTYPE: RM!; ISOTYPES: MO!, NY!, UC!, US!).

*Cressa insularis* House, Bull. Torrey Bot. Club 33:315. 1906. TYPE: MEXICO. REVILLAGIGEDO ISLANDS: Socorro Island, May 27–July 3, 1903, *Barkelew 252* (HOLOTYPE: US!; ISOTYPES: NY!, UC!).

*Cressa erecta* Rydb., Bull. Torrey Bot. Club 40:466. 1913. TYPE: U.S.A. Utah. Salt Lake City County, near Beck's Hot Springs, Jul 1905, *Garrett 870f* (HOLOTYPE: NY!).

*Cressa minima* A. Heller, Muhlenbergia 8:140, tab. 17. 1913. TYPE: U.S.A. NEVADA. Washoe Co.: N side Peavine Mt, 1 Jul 1907, *Heller & Kennedy 8663a* (HOLOTYPE: NY!; ISOTYPES: CAS!, L!, photo FTG-FAU!, NY!, US!), sphaema as *C. pumila* on tab. 17. *C. truxillensis* var. *minima* (A. Heller) Munz, Aliso 4:96. 1958.

*Cressa vallicola* A. Heller, *Muhlenbergia* 8:140, pl. 17, 1912 [1913]. TYPE: U.S.A. CALIFORNIA: 4 Jun 1908, Heller 8936a (HOLOTYPE: UC! ISOTYPES: CAS!, LI, photo FAU!, NY!, US!). *Cressa truxillensis* var. *vallicola* (A. Heller) Munz, *Aliso* 4:96. 1958.

*C. arenaria* Willd. ex Roem. & Schult., *Syst. Veg.* 6:207. 1820. TYPE: "In Americ. merid. Humboldt et Bonpland." There are two sheets: Sheet 1, with XIII on the label, has "in Guanchaco [Huanchaco] areniosis" in Bonpland's hand. Sheet 2 simply has in the upper right corner the numeral 2 along with *Cr. arenaria* written D. F. L. von Schlechtendal. The label has "Habitat in America meridionali," in Willdenow's hand. *Humboldt* 3227 (sheet 1 lectotype, barcode B-W-05422-01-0!)

*Cressa multiflora* Willd. ex Roem. & Schult., *Syst. Veg.* 6:207. 1820. TYPE: Willdenow has written IX on a small label with the name *Cressa* and a drawing of the flower, along with the name "Truxillo" written by Humboldt. The label has "Habitat in America meridionali," a short description in Latin, and *Cressa multiflora* in Willdenow's hand. *Humboldt* s.n. (HOLOTYPE: barcode B-W 05420-01-0!, photo FTG-FAU! This is probably an isotype of *C. truxillensis*).

ALKALI WEED; ZIIX CASA INSII (SERI)

**Perennial herbs.** Stems gray, appressed pilose to silvery-sericeous, not twining, usually much-branched, at first erect, becoming decumbent to spreading, often 8–25 cm long in open, sunny habitats, or often with weak slender stems to 75 cm long when growing through and branching over the tops of other salt-marsh halophytes; stems dying back during adverse times to thickened rhizomes and/or rootstocks often 8–15+ cm below the surface; lower stems often semiwoody. **Leaves** on main branches often larger than those on branchlets, with pubescence like the stems, subsessile or with petioles 0.5–2 mm long; blades mostly 3–10 mm long, 1–4 mm wide, elliptic to lanceolate or ovate-lanceolate, basally cuneate, sometimes obtuse, the apex usually acute; older leaves sometimes thick and succulent in hypersaline habitats. **Inflorescences** of solitary flowers, axillary, usually concentrated in the upper leaf axils and appearing almost spicate. **Flowers** on stalks (peduncles and pedicels) 2–6 mm long, the pedicel much reduced and more slender than the peduncle, the bracteoles ovate to ovate-lanceolate, acute, unequal, 2–3 mm long, mostly 1 mm wide. Sepals  $\pm$  equal or the inner slightly longer; outer sepals obovate, elliptic, 3–4 mm long, 2.5–3 mm wide, obtuse or acute, pubescent; inner sepals obovate, 3–4.5 mm long, 2–3 mm wide, acute, with scarious margins, appressed sericeous only at the apex. Corollas white, becoming scarious when dry and somewhat persistent, salverform, 5–6.5 mm long, the tube 3–3.5 mm long, the limb 5-lobed. Corolla lobes obtuse to  $\pm$  acute, about as long as the tube, somewhat pubescent on the outer surface, becoming reflexed with age. Stamens exerted, 4–6 mm long, usually equal, the filaments basally pubescent with glandular indumentum; anthers red and becoming purple with age, 1–1.5 mm long, oblong with the base cordate to  $\pm$  bilobed. Ovary ovoid, unilocular to  $\pm$  bilocular, apically somewhat hirsute; styles pure white, unequal, 3–5 mm long; stigmas pure white, capitate, smooth. **Capsules** 5–6 mm long, ovoid, shiny brown, surrounded at least basally by the calyx, apically hirsute, unilocular. Seeds usually 1, ovoid, 3–4 mm long, brown, glabrous.  $2n = 28$ .

*Sonora.*—Often common in tidally wet saline mud and sandy soils among saltscrub and margins of mangroves, *esteros*, bays, and low-lying coastal soils from the Río Colorado delta to the Sinaloa border. In northwestern Sonora sometimes in small inland playas but near the coast, and as an agricultural weed south of San Luis, especially in fine-textured silty-clay alkaline soils. Sonoran desert and coastal thornscrub: 0–20 m. Flowering March–December.

In contrast to populations in northwestern Sonora, this species has apparently become relatively rare, at least in recent years, in nearby southwestern Arizona (Austin 1992). In the early 1990s *Cressa* was a common weed in sandy soil of seawater-irrigated experimental plots at the Environmental Research Laboratory adjacent to Estero Morúa at Puerto Peñasco. *Cressa* had been evaluated earlier as a potential halophytic seed crop in these plots. Substantial seed crops were obtained, but no economic value was found and further evaluation was terminated. This is probably the first report of a weed in seawater-irrigated agriculture (Felger 2000).

*General distribution.*—California, Arizona, Nevada, New Mexico, Texas, Utah; Baja California (norte) and Sur, Chiapas, Chihuahua, Coahuila, Colima, Jalisco, Nuevo León, Oaxaca, San Luis Potosí, Sinaloa, Revillagigedo Islands; Ecuador, Peru, Chile, Argentina.

**Mpio Guaymas:** Guaymas, 15 Dec 1939, Drouet & Richards 4015 (CAS!). **Mpio Empalme:** Playa Cochorit, 13 Aug 1985, Felger 85-902B! **Mpio Etchojoa:** Paredoncito on Bahía Tobarí, about 28 mi W of Navojoa, 17 Dec 1988, Sanders 8970 (UCR!). **Mpio Guaymas:** Yasicuri, opposite Las Guásimas, sandy-gravel on upper beach, 16 Mar 1989, Felger 89-190! **Mpio Hermosillo:** Santa Rosa Peninsula, Infiernillo Channel, 4 Mar 1971, Felger 20100!; Kino Bay, 25 Nov 1979, flowers white, Van Devender 93-281 (UCR). **Mpio Hutatabampo:** Playa Las Bocas, near



beach, 6 May 1966, *Friedman 003-96!* **Mpio Puerto Peñasco:** Estero Moruá, 29 Apr 1990, some older leaves succulent, *Felger 91-40.* **Mpio San Luis R.C.:** Colorado River, opposite mouth of Hardy River, 29 May 1894, *Mearns 2842 (CAS!)*; Ciénega de Santa Clara, 5 km S of Rillito, 6 Oct 1985, *Felger 92-989.* **SONORAN ISLANDS:** Alcatraz, Bahía Kino, 4 Dec 2007, *Felger 07-167!*; Tiburón, base and N side of Punta San Miguel, E side of island, 23 Nov 2006, *Wilder 06-366!* (See Felger and Wilder 2012 for additional records.)

**DICHONDRA** J.R. & G. Forster, *Char. Gen. Pl.* 40, t. 20. 1776. [Greek διχονδρα, *di* "double" and *chondra* "a grain," an allusion to the structure of the fruit.]

OREJA DE RATÓN; PONYFOOT, PENNYWORT, FALSE PENNYWORT

**Herbs** with slender glabrous or pubescent and mostly repent stems, from perennial taproots; stems sometimes rooting at nodes. **Leaves** petiolate; blades cordate-orbicular to reniform, small, the margins entire. **Inflorescences** of inconspicuous, axillary, solitary (rarely paired) flowers on short to long peduncles. **Flowers** usually less than 1 cm wide, greenish-yellow or white (purple in *D. occidentalis*, but that one not in the flora area). Sepals ± equal, barely united basally, often spatulate. Corollas broadly campanulate to subrotate when living, appearing funnellform at times when dried, usually deeply 5-lobed, the lobes induplicate. Stamens typically included, more or less equal. Pollen 3-colpate. Ovary 2-lobate to emarginate, the lobes distinct or usually basally united, 2-locular. Styles 2, attached between the lobes and appearing almost gynobasic, filiform, the stigmas capitate. **Fruits** capsular or utriculate, 2-lobed to almost entire, membranaceous, usually 2-seeded, irregularly bivalvate or indehiscent. Seeds obovoid, smooth, the cotyledons linear, 2-plicate.

Species ca. 15; tropics and temperate regions: 8 species in North America, ±7 in South America, the others in Australia and New Zealand.

*Selected references.*—Austin (1998a), Johnston (1963), Tharp and Johnston (1961).

1. Leaves and stems appressed, whitish or canescent-pubescent. Pedicels recurved near the point of attachment of the stolon. Fruits entire or emarginate, carpels often 2-seeded \_\_\_\_\_ **D. argentea**
1. Leaves and stems sparsely appressed pubescent above, leaves more densely below but green or greenish on both surfaces. Fruits deeply bilobed, carpels usually 1-seeded.
2. Lower leaf surfaces glabrous or pubescent, similar in color to the upper surfaces; fruiting peduncles recurved just below calyces \_\_\_\_\_ **D. brachypoda**
2. Lower leaf surfaces densely appressed hairy below, at least on young leaves, usually contrasting with green upper surfaces; peduncles often nodding but not sharply recurved \_\_\_\_\_ **D. sericea**

**Dichondra argentea** Humb. & Bonpl. ex Willd., *Enum. Pl.* 297. 1809. TYPE: COLOMBIA: "Habitat in America meridionali prope Hundam" (from protologue), no date, *Humboldt & Bonpland s.n.* (B-W, presumably barcode B-W 05468-01-0 and the reverse, 05468-02-0, having "*Dichondra argentea* (W)" in what seems to be Willdenow's handwriting).

**Perennial** herbs, whole plant except roots, stamens, corolla and styles silvery-canescens with a dense pubescence of long, silky, usually appressed, flattened hairs; taproots perennial, dark brown, 1.8–4 mm thick; stolons annual, 10–35 from the crown, ca. 0.7–1.1 mm thick, rarely branched; internodes 1–2.5(–3) cm long; nodes often bearing adventitious roots and occasionally short-shoots with crowded nodes. **Leaves** reniform, 5–13 mm long, 12–20 mm broad, apically often shallowly emarginate, basally truncate or broadly and shallowly cordate, with a narrow cuneate base where the blade joins the petiole; petioles (1–)2–3(–5) cm long, 0.5–1 mm thick, erect, straight. **Inflorescences** on pedicels 4–6 mm long, 0.5–1 mm thick, basally sharply recurved. **Flowers** 3.4–4 mm wide. Calyx broadly campanulate, 2–2.6 mm long, accrescent to 2.4–3 mm in fruit, 5-lobed two-thirds to three-fourths the length, the lobes linear-oblong, apically blunt and often somewhat recurved. Corollas nearly cylindrical, cream-colored, 5-lobed about half the length or more, the lobes subulate. Ovary only slightly bilobed. **Fruits** capsules 2.2–2.8 mm long, and 2–2.1 mm wide. Seeds 1.9–2.4 mm long, ovoid to pyriform, dark brown to black when fully mature.

This species is known from southeastern Arizona close to Sonora as well as southwestern New Mexico and Chihuahua and is likely to be in the Chihuahuan desert region of northeastern Sonora (Austin 1998a). Also in Chiapas, Coahuila, Durango, Edo México, Nuevo León, San Luis Potosí, Tamaulipas, Zacatecas.

**U.S.A. ARIZONA:** Cochise Co.: Bisbee, 26 Sep 1931, *Harrison 8256!* **NEW MEXICO.** Luna Co.: S end of Florida Mountains, Copper Kettle Canyon, 4997 ft, 1 Sep 2006, *Jercinovic 617 (UNM!).* **MEXICO. CHIHUAHUA:** Mpio Ojinaga: Chihuahua, 13 (rd) miles N of La Perla (81 miles S of Ojinaga) along Hwy 18 (Ojinaga-Camargo), on small lava knoll along Hwy, 4900 ft. 17 Sep 1972, *Henrickson 7724!* **Mpio. Aquiles**

**Serdán:** 7 mi SE of Tomás García, SE end of Sierra de Mapula, 1.5 mi off road toward mts, Rancho El Ojito, vicinity of Pico Ojito, vicinity 28°28'N, 105°45'W, ca. 4300 ft, chaparral grassland with many cacti, 19 Jul 1977, *Lehto L-21558* (ASU!).

**Dichondra brachypoda** Wooton & Standl., *Contr. U.S. Natl. Herb.* 16:160. 1913. TYPE: U.S.A. NEW MEXICO. Doña Ana Co.: Organ Mountains, Filmore Canyon, 23 Sep 1906, *Wooton & Standley s.n.* (HOLOTYPE: US!; ISOTYPE: NMC 21191!).

**Herbs** with a perennial taproot, and annual stolons, stems closely hairy with soft, silky appressed hairs, giving the plant a pale tawny-green cast. **Leaves** herbaceous; blades suborbicular to reniform, 8–40 mm long, 10–55 mm wide, the apex often shallowly emarginate, the base truncate to broadly cordate, usually with a deep sinus, the lower surface glabrous or pubescent, the upper surface sparsely pubescent; petioles 1.5–15 cm long, arcuate or curved. **Inflorescences** on peduncles 5–26 mm long, sharply recurved, usually in the upper portion. **Flowers** 3.5–5 mm in diameter. Calyx broadly campanulate, the sepals lanceolate, 2.5–4 mm long at anthesis, accrescent to 3.8–5.2 mm long in fruit, the outer surfaces villous. Corollas cream colored, campanulate, 3.5–5 mm long, 5-lobed about  $\frac{2}{3}$ – $\frac{3}{4}$  of the length, the lobes lanceolate, acute, and villous on outer surfaces. **Fruits** capsular, 6–7 mm long, 3–5 mm wide. Seeds 1 or 2, pyriform, 1.5–2.3(–4) mm long, brown.

**Sonora.**—Canyon slopes and riparian habitats, often in shaded niches, among oak woodland and pine-oak forests in the northeastern part of the state, and higher mountains along the Chihuahua border in the southeastern part of the state; 1300–2000 m. Flowering mostly August–October.

**General distribution.**—Southeastern Arizona, New Mexico, Texas; Chihuahua, Coahuila, Durango, Hidalgo, Edo. México, Oaxaca, San Luis Potosí, Zacatecas.

**Mpio Agua Prieta:** Sierra San Luis, Rancho Pan Duro, 2000 m, flowers white, localized beneath *Pinus chihuahuana*, pine-oak woodland with *Juniperus deppeana*, *Quercus emoryi*, *Pinus engelmannii*, 25 Jul 1993, *Felger 93-518A!* **Mpio Cananea:** Rancho Las Gallinas, 1260 m, E of Cerro Bola, eastern Sierra Azul, sycamore-willow-juniper riparian forest, locally common in sandy soil under shrubs in canyon bottom, 26 May 2005, *Van Devender 2005-907!* **CHIHUAHUA: Mpio Chínipas:** Along the Sonora border, Sierra Saguaribo (Sierra Tecorahui), 2 mi SW of Tecorahui, [vicinity] 27°07'N, 108°39'W, ca. 1300 m, common in shade beneath trees, leaves green on both surfaces, 23 Oct 1961, *Felger 5543!*

**Dichondra sericea** Sw., *Prodr.* 54. 1788. TYPE: JAMAICA: Swartz (HOLOTYPE: S!, ISOTYPE: BM, not seen). *Dichondra repens* var. *sericea* (Sw.) Choisy in DC., *Prodr.* 9:451. 1845.

*Dichondra repens* of authors, not J.R. Forst. & G. Forst.

**Herbs** with a perennial taproot, and annual stolons sometimes rooting at nodes, the stems sparsely to densely appressed hairy. **Leaves** chartaceous to subherbaceous; blades suborbicular, 8–20 mm long, 7–19 mm wide, the apex rounded or usually shallowly emarginate, the base cordate with shallow to deep sinuses, the lower surface densely hairy when young, less so when older and giving a silvery sheen, the green upper surface green in contrast, the differences most notable on younger leaves and sometimes becoming difficult or impossible to detect on older leaves; petioles 0.5–7 cm long, weak, arcuate, curved. **Inflorescences** on peduncles 5–35 mm long, arching, erect, to slightly nodding or curved but not recurved in the upper part. **Flowers** 3–4 mm wide. Calyx campanulate; sepals obovate to obovate-spathulate, 1.5(–2.5) mm long, reaching 3.3 mm in fruit, 1 mm wide at widest point, the outer surfaces sericeous, the inner surfaces sparsely sericeous. Corollas yellow-green, campanulate, slightly shorter than the calyx, 1.5(–2) mm long, 0.5 mm wide, the sinuses nearly reaching the base, the lobes lanceolate, acute, and glabrous. **Fruits** utricle-like, 2–3.5 mm long, 1.8–2.5 mm wide, falling in two parts or one, each half dehiscing loculicidally. Seeds 1 or 2, pyriform, 1.5(–2.1) mm long, brown.

**Sonora.**—Mountains near the Chihuahua border in east-central and southeastern parts of the state, mostly in moist, shaded or riparian habitats in canyons among oak woodland and pine-oak forest; ca. 1200–1500 m. Flowering mostly August–December.

**General distribution.**—Southern Arizona; Baja California Sur, Chihuahua, Nuevo León, Tamaulipas, Veracruz, Durango, San Luis Potosí, Guanajuato, Hidalgo, Edo. México, Distrito Federal, Puebla, and Chiapas; Central and South America; West Indies.

**Mpio Álamos:** Santa Bárbara, 27°07.2'N, 108°43.3' W, 1300 m, 23 Oct 1992, *Jenkins 92-88!*; Rancho El Rayo, on road to Chínipas, 27°15.4'N, 108°37.9'W, 1500 m, *Martin & Yetman 18 Aug 1991!* **Mpio Yécora:** Río Maycoba, ca. 1 km upstream from Hwy 16 crossing, 28°22.5'N,

108°45'W, 1210 m, 7 Sep 1995, Fishbein 2526!; La Pila, 0.6 km E of El Trigo Moreno, riparian forest in pine-oak forest, 28°17'48"N, 108°47'11"W, 1450 m, 30 Aug 2008, Reina-G. 2009-429!

**EVOLVULUS** L., Sp. Pl., ed. 2, 1:391. 1762. [Latin, *evolvulare*, to enroll, an allusion to their non-twining habit.]

DWARF MORNING GLORY

**Herbs** or small suffrutescent shrubs, annual or perennial, not twining but sometimes creeping. **Leaves** usually small; blades ovate to almost linear, entire. **Inflorescences** of 1–several-flowered axillary cymes, pedicellate, pedunculate, or sessile. **Flowers** on pedicels about as long as calyx or pedicels apparently absent. Sepals equal or subequal. Corolla conspicuous, blue, or inconspicuous, faded pale bluish-white, rotate, funnelform or salverform, the limb plicate, mostly subentire, the lobes pilose externally. Stamens with filiform filaments, the anthers ovate to oblong or linear; pollen 3-colpate, 12-rugate. Ovary 2-locular, each locule 2-ovulate, sometimes 1-locular and 4-ovulate. Styles 2, free or partially united at the base, each style deeply bifid for at least half its length into long, terete, filiform to subclavate stigmas. **Fruits** of capsules, globose to ovoid, 4-valved. Seeds 1–4, small, smooth or minutely verrucose.

Species ca. 100; all native to the New World. Two species have become widespread in the Old World. There are 7 or 8 species in Sonora and 17 in North America.

*Selected references.*—Austin (1990b), van Ooststroom (1934), Ward (1968).

1. Stems creeping, prostrate. Leaves about wide as long. Flowers with pedicels but lacking peduncles.
2. Leaves distichous and imbricate, broadly ovate to orbicular or wider than long; petioles 0.5–1 mm long. Corollas white \_\_\_\_\_ **E. prostratus**
2. Leaves distichous but not imbricate, broadly ovate to ovate or elliptic; petioles 1–2 mm long. Corollas blue \_\_\_\_\_ **E. rotundifolius**
1. Stems straight, erect to spreading. Leaves at least twice as long as wide. Flowers with pedicels and/or peduncles.
3. Pedicels absent; flowers solitary (usually) in leaf axils.
4. Leaves markedly distichous. Sepals lanceolate to narrowly lanceolate, spreading pilose \_\_\_\_\_ **E. sericeus**
4. Leaves usually not distichous. Sepals oblong-lanceolate, appressed-pilose \_\_\_\_\_ **E. nuttallianus**
3. Pedicels present, flowers clustered into cymose groups.
5. Stems appressed pilose to tomentose, rarely with spreading trichomes. Leaves lanceolate to linear-lanceolate. Corollas (10–)12–22 mm wide. Sepals pilose to tomentose, 3–3.5 mm long \_\_\_\_\_ **E. arizonicus**
5. Stems essentially glabrous or pubescent. Leaves elliptic, ovate or oblong to lanceolate or narrowly lanceolate to linear. Corollas mostly less than 10 mm wide. Sepals glabrous or sparsely to densely pilose, 2–2.5 mm long.
6. Stems with long spreading trichomes. Leaves elliptic, ovate or oblong to lanceolate. Corollas (5–) 7–10 mm wide. Sepals densely pilose \_\_\_\_\_ **E. alsinoides**
6. Stems usually sparsely pubescent. Leaves linear to narrowly lanceolate. Corollas 3.5–4 mm wide. Sepals glabrous or sparsely pilose \_\_\_\_\_ **E. filipes**

**Evolvulus alsinoides** (L.) L., Sp. Pl., ed. 2, 1:392. 1762. TYPE: SRI LANKA: Hermann Herb. 3:55 (LECTOTYPE: BM!; ISOLECTOTYPES: S! UPA!). *Convolvulus alsinoides* L., Sp. Pl. 1:157. 1753.

*Evolvulus alsinoides* var. *angustifolius* Torr., Rep. U.S. Mex. Bound., Bot 2(1):150. 1859. TYPE: U.S.A. TEXAS. Presidio Co.: near the Great Cañon of the Rio Grande, Aug, Parry s.n. (HOLOTYPE: not located).

*Evolvulus alsinoides* var. *acapulcensis* (Willd.) Ooststr., Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 14:54. 1934. *Evolvulus acapulcensis* Willd., Syst. Veg. 6:199. 1820. TYPE: MEXICO. GUERRERO: ca. Acapulco, Willdenow 6128 (HOLOTYPE: barcode B-W 06128-01-0!).

OREJA DE RATÓN, BABOCILLO (fide Rea 1208); MOUSE EARS; LA'Á HUHODAM SAH'I (PIMA BAJO, "LAUGHING BUSH/HERB," fide Rea 1208)

**Herbs**, perennial; stems prostrate or ascending, 6–50 cm long, loosely appressed pilose and with some hairs spreading. **Leaves** ovate, oblong or elliptic to lanceolate, 8–25 mm (exceptionally to 44 mm in extreme SE Sonora mountains) long, 3.5–11 mm wide, the apex obtuse and mucronulate, the base acute to rounded, sparsely to densely pilose on both surfaces, with strongly and loosely appressed, soft, short, grayish trichomes. **Inflorescences** 1 or 2 flowers on filiform peduncles, shorter or longer than the leaves. **Flowers** on pedicels 2–4 mm long, short pilose; bracteoles linear-subulate. Sepals lanceolate, 2–2.5 mm long, acuminate, short pilose. Corollas pale blue or white, rotate, (5–) 7–10 mm wide, filaments 2–3 times as long as the anthers. Ovary globose to ovoid, glabrous. **Capsules** 3–4 mm wide, globose, 4-valved, reflexed, glabrous. Seeds 1–4, ovoid, tan to brown, glabrous.

*Sonora*.—Sonoran desert, desert grassland, coastal and foothills thornscrub, tropical deciduous forest, oak woodland, and pine-oak forest. Natural and disturbed sites, often somewhat xeric and rocky habitats. Nearly statewide and one of the most widely distributed members of the family in Sonora. Near sea level–1650 m. Flowering much of the year, depending on soil moisture and temperature.

*General distribution*.—Arizona, New Mexico, Texas, Florida; Aguascalientes, Baja California Sur, Chiapas, Chihuahua, Coahuila, Nuevo León, Tamaulipas; Mesoamerica and South America.

Van Ooststroom (1934) recognized fifteen varieties around the world. Sonora, Arizona, New Mexico, and Texas plants belong to var. *angustifolia* Torrey. This variety typically has shorter sepals, narrower leaves, less densely pubescent stems, and tends to have shorter stems than other varieties.

**Mpio Agua Prieta:** Colonia Morelos, 2600 ft, 15 Sep–4 Oct, *White 4499!*; Ca. 10 km SW of Agua Prieta, 1287 m, 2 Oct 2004, *Van Devender 2004-1110!* **Mpio Álamos:** San Bernardo, *Gentry winter 1934-35!*; Güirocoba, 14 Nov 1933, *Gentry 826M!* **Mpio Arizpe:** 19 km N of Sinoquite on SON 89, foothills thornscrub, 30°19'23"N 110°12'25"W, flowers blue, open 12:00 a.m., 16 Sep 2000, *Reina-G. 2000-728!* **Mpio Bacoachi:** Sierra de los Ajos, 30°44'N, 109°59'W, 1150 m, 22 Apr 1995, *Fishbein 2280!* **Mpio Bavispe:** Santa Rosa Canyon, near Bavispe, 3850 ft, 20 Jul 1938, *White 611!*; Río Bavispe, Cañón de la Petaquilla, 15 Aug 1940, *White 3332!* **Mpio Carbó:** 14.6 mi by MEX 15 N of Pesqueira Junction 1800 ft, 19 Aug 1960, *Felger 3845!*; El Tecolote road (1.2 mi N of El Oasis) W of Mex 15, 27 Aug 1983, *Reichenbacher 1471!* **Mpio Cucurpe:** Palm Canyon, 17 mi SE of Magdalena, *Van Devender 16 Jul 1977!* **Mpio Gen. Plutarco Elías:** 16 mi S[E] of Sonoyta on MEX 2, 14 Apr 1963, *Felger 7537!* **Mpio Guaymas:** Nacapule, 25 Feb 1985, *Felger 85-248!* **Mpio Hermosillo:** Rocky lower slopes of Sierra de Calena S of Villa de Seris, 13 Nov 1939, *Drouet & Richards 3566 (MO!)*; Rocky hillside, Hermosillo, 220 m, 29°05'N, 110°54'W, 25 Nov 1939, *Drouet & Richards 3754 (MO!)*; Sierra Seri, 550 m, 2 Feb 1969, *Felger 18130!* **Mpio Hutabampo:** Camahuiroa, 23 Nov 1993, *Friedman 330-93!* **Mpio La Colorado:** 1 mi W of Colorado, *Wiggins & Rollins 310!* **Mpio Moctezuma:** 8 mi E of Moctezuma, rd to Huásabas, 800 m, 17 Mar 1979, *Reichenbacher 189!* **Mpio Ónavas:** Ónavas, 11 Oct 1986, *Rea 1208!* **Mpio San Javier:** Cerro Verde to San Javier, *Martin & Ferguson 10 Mar 1990!* **Mpio Sahuaripa:** Mesa Cureda, 33.8 km (by air) NNE of Sahuaripa, Northern Jaguar Reserve, 29.32194°N, 109.07111°W, 945 m, buffelgrass pasture in foothills thornscrub, 1 Sep 2009, *Van Devender 2009-649 (USON!)*. **Mpio Soyopa:** 1.5 km E of Tónichi, 28°34'10"N 109°33'00"W, 180 m, 4 Sep 1996, *Van Devender 96-357!* **Mpio Ures:** 6 mi N of Ures, 20 Sep 1934, *Shreve 6708!* **Mpio Yécora:** 4 km SW of Santa Ana de Yécora, 745 m, 23 Sep 1977, *Goldberg 77-170!*; Agua Amarilla, 1000 m, *Martin 14 Mar 1989!* **SONORAN ISLANDS. Tiburón:** E side of island, E base of Sierra Kunkaak, 1 Jan 2006, *Wilder 06-4!*; NE base of Sierra Kunkaak, 25 Oct 2007, *Felger 07-108!*

***Evolvulus arizonicus*** A. Gray, *Syn. Fl. N. Amer.* 2(1):218. 1878. TYPE: MEXICO. SONORA: sandy prairies, Sep 1856, *Thurber 1023* (LECTOTYPE: GH!). Van Ooststroom (1934: 74) designated a *Pringle* specimen as lectotype but there is no indication it was part of the original material used by Gray, and Austin (1990b) considered that action a neotypification.

*Evolvulus laetus* A. Gray, *Proc. Amer. Acad. Arts* 17:228. 1882. TYPE: U.S.A. ARIZONA: 1881, *Pringle s.n.* (HOLOTYPE: GH!; ISOTYPES: BR!, FI!, KL, NY!, P!, PH!, U!, US!). *Evolvulus arizonicus* var. *laetus* (A. Gray) Ooststr., *Meded. Bot. Mus. Herb. Rijks Univ. Utrecht* 14:76. 1934.

Suffrutescent **herbs**, densely appressed pilose to almost woolly tomentose throughout. Stems few to many, arising from a woody base, erect to ascending or decumbent, 10–30(–45) cm long. **Leaves** lanceolate to linear-lanceolate, 10–25(–35) mm long, 2.5–6(–14) mm wide, gradually decreasing in size toward apex, the upper leaves linear, acute or obtuse apically, attenuate basally; petioles absent or short, sparsely to densely pilose on both surfaces, with strongly and loosely appressed, soft, short, grayish trichomes. **Inflorescences** cymose, 1–3 flowered on slender peduncles usually as long as or longer than the leaves. **Flowers** on pedicels 3–4(–8) mm long, reflexed in fruit; bracteoles linear-subulate, 1.5–3 mm long. Sepals equal, lanceolate, acuminate, 3–3.5 mm long. Corollas rotate to broadly campanulate, blue or blue with white stripes, (10–)12–22 mm wide. Filaments inserted near the corolla base, 1.5–2 times as long as the linear anthers. Ovary globular, glabrous. **Capsules** globular, 3.5–4 mm long, reflexed, glabrous. Seeds 2–4, 1–1.25 mm long, tan to brown, glabrous.

*Sonora*.—Widespread in eastern and central Sonora; Sonoran desert (Plains of Sonora), grassland including mesquite grassland, foothills thornscrub, tropical deciduous forest, oak woodland, and pine-oak forest. Natural and disturbed sites, often in rocky habitats; 150–ca. 1200 m. Flowering mostly August–December.

*General distribution*.—Arizona, New Mexico; Chihuahua; disjunct in Argentina.

This species is easier to recognize in living material than on some herbarium specimens. Some have recognized two varieties that are not distinct.

*Selected reference*.—Austin (1990b).

**Mpio Agua Prieta:** Rancho Nuevo, Cajón Bonito, 2 May 1976, *Mason 3213b!* **Mpio Álamos:** Mocúzari, La Cruz, 17°13'N, 109°05.5'W, 1500 m, *Martin 17 Mar 1989 (FTG-FAU!)*; Between Las Chinacas and La Lobera on road to Chinipas, 1500 m, *Martin & Yetman 18 Aug 1991!*; El Guayabo (upper) crossing of the Rio Cuchujaqui 3 km NE of Sabinito Sur and 15 km (airline) ESE of Álamos, near 27°00'N, 108°47'W, 3500

m, tropical deciduous forest, 12 Oct 1992, *Sanders 12893* (UCR!); Sierra de Álamos, ridge between Cañon Algoroba and Cañon Los Tomates, above Parque Chalaton in the Sierra, off Chalaton Trail, near 26°59'N, 108°58'W, tropical deciduous forest, 19 Mar 1993, *Sanders 13458* (UCR!); Sierra de Álamos, upper SW fork of Cañón El Huirotal, near 26°57'N, 108°58'30"W, 950–1300 m, steep rocky canyon in transition from tropical deciduous forest to oak woodland, uncommon perennial moist grassy area, 7 Apr 1994, *Sanders 14410* (UCR!). **Mpio Arizpe:** Arizpe, 18 Aug 1958, *Turner 196*! **Mpio Benjamin Hill:** Rancho el Carrizo, 2400 ft, *Tomelson 7 Aug 1968*! **Mpio Carbó:** 1.2 mi N of El Oasis, 730 m, 6 Aug 1982, *Reichenbacher 982*! **Mpio Cumpas:** 8 mi SE of Cumpas on rd to Moctezuma, 24 Sep 1934, *Wiggins 7427*! **Mpio Fronteras:** 13 mi SW of Esqueda, oak zone, 28 Aug 1953, *Ownbey 1770* (MIN!). **Mpio Moctezuma:** 8 mi E of Moctezuma, 17 Mar 1979, *Reichenbacher 195*! **Mpio Opodepe:** 10 km S of Benjamín Hill, 750 m, 10 Sep 1994, *Van Devender 94-457*! **Mpio Santa Cruz:** Rancho Los Fresnos, Nature Conservancy reserve in upper San Pedro River drainage, US-Mexico border, 31.3205°N, 110.3667°W, 1555 m, grassland with isolated patches of oak-mesquite woodland, 22 Sep 2006, *Boyle 7871*! **Mpio Soyopa:** MEX 16, just S of Tónichi, 28°34'15"N, 109°33'09"W, 200 m, 21 Sep 1997, *Reina-G. 97-972* (FTG-FAU!). **Mpio Yécora:** Yécora, 1550 m, open pine-oak forest, common, 7 Sep 1995, *Fishbein 2472*!

***Evolvulus filipes*** Mart., *Flora* 24 (2, Beibl.):100. 1841. TYPE: BRAZIL. BAHIA: Rio Sao Francisco near Joazerio, *Martius s.n.* [Schedulae Nro. 2313] (B, not seen, BR!, M, not seen).

*Evolvulus linifolius* of authors, not L.

Annual **herbs**, the stems erect to ascending, delicate, generally sparsely pubescent. **Leaves** linear or narrowly lanceolate, 1–2.5(–3) cm long, usually 2–5 mm wide, sessile or ± sessile or sometimes short-petioled on larger leaves, cuneate basally, acute apically, sparsely pilose on the upper surface, slightly more pubescent on the lower surface. **Inflorescences** cymose to solitary, on peduncles usually 1–2.5 cm long or slightly longer. **Flowers** 1(–3) on pedicels to 2.5 mm long, short-pilose; bracteoles lanceolate to subulate, 1–2 mm long. Sepals lanceolate 2–2.5 mm long, glabrous or pubescent and ciliate. Corollas pale blue or white, 3–5 mm long, rotate, with 5 sericeous bands outside, filaments ca. 2 mm long. Ovary globose, glabrous. **Capsules** globose to ovoid, 3–4 mm long, reflexed, glabrous, brown. Seeds 1–4, smooth, dark brown to black.

**Sonora.**—Several specimens identified to this species are from the eastern part of the state in tropical deciduous forest and oak woodland.

**General distribution.**—Coahuila, Durango, Michoacán, Sinaloa, Veracruz; Mesoamerica; South America.

This species is weakly differentiated from *E. alsinoides*. In South America they appear to be distinctive, while in Mexico they are not always separable. The Sonora specimens have the appearance of first season plants of *E. alsinoides*. Perhaps those called *E. filipes* in part (or all) of the range are nothing more than depauperate or first season *E. alsinoides*, but there are insufficient data to confirm or deny that suspicion and we reluctantly retain them as separate until more detailed studies are made.

**Mpio Álamos:** El Guayabo, on road 18 km E of Álamos, 27°0'20"N, 108°47'10"W, 250 m, *Martin 16 Mar 1989* (FTG-FAU!). **Mpio Cucurpe:** Palm Canyon, 15 SE of Magdalena, Cerro Cinto de la Plata, along stream, 1 Sep 1979, *Toolin 453-C* (2 sheets, ARIZ 220685!, ARIZ 221490!) **Mpio Ures:** Upper Cañada El Yugo, Sierra Mazatán, open oak woodland and on Catalina gneiss, 29°06'07"N, 110°11'48"W, 1300 m, common annual on open rocky areas, 10 Oct 2004, *Van Devender 2004-1306*!

***Evolvulus nuttallianus*** Roem. & Schult., *Syst. Veg.* 6:198. 1820, New name for *E. argenteus* Pursh (1814 [1813]), not Brown (1810). TYPE: U.S.A. MISSOURI: Rapid River, "On the banks of the Missouri," (protologue), (from PH sheet), *Nuttall s.n.* (HOLOTYPE: B was apparently destroyed during the Second World War, although van Ooststroom 1934: 122 saw it before the war; ISOTYPE: PH!).

*Evolvulus pilosus* Nutt., *Gen. N. Amer. Pl.* 1:174. 1818, nom. pro syn. TYPE: based on the same collection as *E. nuttallianus* (HOLOTYPE: PH!).

*Evolvulus argenteus* Pursh, *Fl. Amer. Sept.* 1:187. 1814 [1813], not R. Br. (1810). TYPE: based on the same collection as *E. nuttallianus* (HOLOTYPE: PH!).

*Evolvulus oreophilus* Greene, *Leafl. Bot. Observ. Crit.* 1(11):151. 1905. TYPE: U.S.A. NEW MEXICO: Sierra [Co.]: S end of the Black Range, 1 mi W of Hillsboro, dry hills, 5500 ft, 16 Aug 1904, *Metcalf 1228* (LECTOTYPE designated here: US!; ISOTYPES: MO! NMC! NY!)

Suffrutescent **herbs**, the stems several, erect to ascending, 10–15 cm long, densely spreading-pilose with an indumentum of ferruginous, brown, fulvous or gray color. **Leaves** linear-oblong, narrow-lanceolate to narrow-oblong or rarely oblong, 8–20 mm long, 1.5–5 mm wide, attenuate basally, acute to obtuse apically, densely pilose on both surfaces; petioles short or absent. **Inflorescences** solitary, in axils over most of the length of stem; peduncles short or absent. **Flowers** on pedicels 3–4 mm long, becoming reflexed in fruit; bracteoles subulate, 1–4 mm long. Sepals lanceolate to narrowly lanceolate, long-acuminate, 4–5 mm long, spreading villose. Corollas rotate to broadly campanulate, 8–12 mm wide, subentire, purple or blue. Anthers 1–2 mm

long, oblong, basally auriculate; filaments twice as long as the anthers. Ovary subglobose, glabrous. **Capsules** ovoid, about as long as sepals, reflexed, glabrous. Seeds (1) 2, brown, smooth.

This species grows in the mountains of southeastern Arizona near the Mexican border (Austin 1991, 1998b) and probably will be found in northeastern Sonora in oak woodland and pine-oak forest; 820–2450 m. Flowering April–September.

*General distribution.*—Arizona, New Mexico, and Texas to Montana, North Dakota, Illinois, Arkansas, disjunct in Tennessee; Chihuahua, Coahuila.

**Evolvulus prostratus** B.L. Rob., Proc. Amer. Arts 29:320. 1894. TYPE: MEXICO. JALISCO: near Guadalajara, 26 Jul 1893, Pringle 4445 (LECTOTYPE designated here: NY!; ISOLECTOTYPES: GOET!, KI!, PH!). MEXICO. HIDALGO: Real del Monte. Coulter 1011 (SYNTYPE: K, not seen). MEXICO: Valley of Mexico at Santa Fé, 5 Jul 1865–66, Bourgeau 323 (SYNTYPE: P, not seen).

Perennial **herbs**; stems few or several from a woody perpendicular root, prostrate, 10–20 cm long, sericeo-villose, with fulvous, grayish or whitish trichomes, glabrescent. **Leaves** distichous, more or less imbricate, at right angles to the stems or somewhat reflexed, broadly-ovate to orbicular or sometimes broader than long, 9–16 mm long, 7–16 mm wide, apically rounded to somewhat emarginate, basally truncate to cordate or rounded, covered with appressed silky-villose, light-brown to grayish trichomes below, green and glabrous above, the petioles 0.5–1 mm long. **Inflorescences** mostly solitary, axillary, sessile or on peduncles to 2 mm long. **Flowers** 1(2) on pedicels 2–3 mm long, appressed-villose; bracteoles oblong to linear-oblong, to 3.5 mm long. Sepals ovate-oblong to ovate, 3–4.5 mm long, acute, appressed-villose. Corollas white, outer surfaces of corollas in bud and midpetaline conspicuously tawny sericeous-hirsute, rotate to broadly funnelform, tube short, the limb 10–12 mm wide. Anthers 1–2 mm long, filaments 3–4 times as long as the anthers. **Capsules** globose, 4-valved, 3–5 mm long, glabrous. Seeds 1–4, brown, glabrous.

*Sonora.*—Pine-oak forest in east-central Sonora; 1550 m. Flowering at least in September.

*General distribution.*—Chihuahua, Distrito Federal, Durango, Hidalgo, Jalisco, Michoacán, Nayarit, Nuevo León, Oaxaca, Puebla, San Luis Potosí, Veracruz.

**Mpio Yécora:** Yécora, 28°23½'N, 108°54½'W, 1550 m, open pine forest, occasional, 7 Sep 1995, Fishbein 2481!; Yécora, near baseball field and cemetery, 28°22'25"N, 108°56'W, 1540 m, common on clay flats, 5 Sep 1996, Reina-G. 96-377 (FTG-FAU!).

**Evolvulus rotundifolius** (S. Watson) Hallier f., Bot. Jahrb. Syst. 16:530. 1893. TYPE: MEXICO. CHIHUAHUA: damp places, pine plains, base of the Sierra Madre, 30 Sep 1887, Pringle 1341 (HOLOTYPE: GH!; ISOTYPES: B, not seen, BM, not seen, F!, KI!, MO!, NY!, PH!, RSA!, US!). *Breweria rotundifolia* S. Watson, Proc. Amer. Acad. Arts 23:281. 1888.

Perennial **herbs**; stems several from a woody root, prostrate, 10–15 cm long, sericeo-villose, glabrescent toward the base. **Leaves** distichous but not imbricate, at right angles to the stem, ovate to elliptic, sometimes broad-ovate, 13–22 mm long, 8–12 mm wide, apically obtuse to somewhat emarginate, basally rounded to cordate, appressed sericeo-villose below, glabrous above, the petioles 1–2 mm long. **Inflorescences** axillary, sessile, and 1-flowered. **Flowers** sessile; bracteoles linear-oblong, to 6 mm long. Sepals ovate-oblong to oblong, 4–5 mm long, acute, appressed-villose. Corollas blue with a white throat and midpetaline stripes, rotate to broadly funnelform, the tube short, the limb 10–13 mm wide. Filaments 2–4 mm long; anthers 1–2 mm long. **Capsules** globose, 4–5 mm long, 4-valved, glabrous. Seeds 1–4, brown, glabrous.

*Sonora.*—East-central and southeastern Sonora near the Chihuahua border; arroyos and open areas in oak woodland, pine-oak forest, and mixed conifer forest (with *Abies durangensis*, etc.); 1600–2100 m. Flowering August–September;

*General distribution.*—Chihuahua, and Durango; reported but not verified for Aguascalientes and Querétaro.

**Mpio Álamos:** Rd to Chiribo from Huicoche, 1 km W of Los Llaitos (El Sahuaribo), 27°19'N, 108°40'W, 1600 m, 21 Aug 1991, Martin & Yetman 21 Aug 1991! **Mpio Yécora:** Mesa El Campanero at head of Barranca el Salto, 2040 m, arroyo margin in pine-oak forest with *Abies durangensis*, *Arbutus xalapensis*, *Quercus rugosa*, etc., 9 Sep 1995, Fishbein 2585!; N end of Mesa Campanero at head of Barranca el Salto, 28°21.5'N, 109°01.5'W, 2040 m, shallow arroyo margin in pine-oak forest, prostrate perennial, flowers blue, uncommon, 2 Jul 1994, McMahon 160 (FAU-FTG!); El Kípor (Quipur), Arroyo El Kípor, pine-oak forest, 28°24'25"N, 108°35'40"W, 1640 m, common herbaceous perennial in clay

on edge of field, flowers light blue, 11 Sep 1996, *Van Devender* 96-526 (FTG-FAU!); N end of Mesa del Campanero (El Remedio), flat pine-oak forest, 28°21'54"N, 109°01'48"W, 2100 m, common herbaceous perennial ground cover, flowers lavender with white centers, 14 Jul 1997, *Van Devender* 97-633 (FTG-FAU!).

***Evolvulus sericeus*** Sw., Prodr. 55. 1788. TYPE: JAMAICA: Swartz s.n. (HOLOTYPE: SI; ISOTYPES: BM!, M, not seen).

*Evolvulus wilcoxianus* House, Bull. Torrey Bot. Club 33:315. 1906. TYPE: U.S.A. ARIZONA: near Ft. Huachuca Arizona, 1894. *Wilcox* 96 (HOLOTYPE: US!). *E. sericeus* var. *discolor* (Benth.) A. Gray f. *wilcoxianus* (House) Ooststr., Med. Bot. Mus. Herb. Rijks Univ. Utrecht 14:132. 1934.

Perennial **herbs**; stems woody at the base, 10–30 cm long, prostrate or ascending, silky, with appressed to more or less spreading trichomes, often gray, white or fulvous. **Leaves** distichous, lanceolate, oblong-lanceolate, oblong or ovate to elliptic, 4–25 mm long, 2–10 mm wide, densely hairy below, glabrous or hairy above, the apex acute, mucronate, the base rounded to acute, the petioles very short or leaves sessile. **Inflorescences** solitary, axillary, sessile or on peduncles to 4 mm long; bracteoles subulate, to 2–4.5 mm long. **Flowers** lacking pedicels. Sepals oblong-lanceolate, 3–5 mm long, acuminate, silky. Corollas pale blue, pale violet or white, rotate to broadly funnelform, 7–12 mm across, subentire. Filaments 2–3 times as long as the oblong anthers. Ovary globose, glabrous. **Capsules** globose, 4-valved, glabrous. Seeds 1–4, ca. 1.5 mm long, brown or black.

*Sonora*.—Known for certain from disturbed habitats in desert grassland in the northeast part of the state, but it is probably more widespread; 1400–1800 m. Flowering May–September.

*General distribution*.—Arizona, New Mexico, Texas; Chihuahua, Coahuila, Nuevo León, Tamaulipas, and Durango southward to Chiapas; Mesoamerica; South America, and the West Indies.

Two varieties have been recognized: var. *sericeus* (leaves sericeous above and below) and var. *discolor* (Benth.) A. Gray (leaves glabrous above). These minor variants are not recognized since they can be found in the same stand.

**Mpio Cananea**: 15 km NE of Cananea on Mex 2, 1505 m, desert grassland, very common, roadside, 23 Apr 2004, *Reina-G.* 2004-309! **Mpio Santa Cruz**: Santa Cruz, 31°13'57"N 110°35'54"W, uncommon, in grassy school yard, flowers white, 17 Jul 2001, *Reina-G.* 2001-551 (ARIZ!, USON!).

**IPOMOEA** L., Sp. Pl. 159. 1753. [Greek *ipos*, a worm, *homoios*, like, a reference to the twining habit]. *Batatas* Choisy, *Calonyction* Choisy, *Exogonium* Choisy, *Quamoclit* Moench, *Pharbitis* Choisy

#### MORNING GLORY

**Vines, lianas, shrubs, or trees**, the stems herbaceous to woody, usually twining, sometimes prostrate or floating, glabrous or hairy. **Leaves** variable in shape and size; blades simple, lobed, divided or less often compound, petiolate. **Inflorescences** mostly axillary, 1 to many flowers, in cymes, rarely paniculate. **Flowers** on long or short pedicels, the bracts scale-like to foliose. Sepals herbaceous to ± coriaceous, ovate to oblong or lanceolate, often somewhat enlarged in fruit but usually not markedly accrescent. Corollas purple, red, pink, white, or less often yellow (flowers with white corollas sometimes occur among normally non-white flowers), regular or rarely slightly zygomorphic, mostly funnelform, less often campanulate, tubular or salverform, the limb shallowly or rarely deeply lobed, the midpetaline bands well defined by 2 distinct veins; stamens included or less often exserted, the filaments filiform, often triangular-dilate at the base, mostly unequal in length. Ovary usually 2–4 locular, 4-ovulate, less often 3-locular, 6-ovulate. Style simple, filiform, included or less often exserted; stigmas capitate, entire or 2(3)-lobed, globose. Fruits globose to ovoid capsules, mostly 4(–6)-valved or splitting irregularly. Seeds 1–4 (6; to 10 in *I. decasperma*).

Perhaps 600 species worldwide, most diverse in tropical and subtropical regions; 41 species known in Sonora.

1. Erect herbs or woody shrubs or trees.
2. Herbs, some with stems woody below.
3. Leaves pinnatifid, the segments filiform.
4. Stems woody below. Leaves pinnatifid with 3–9 filiform segments 3–60 mm long >1 mm wide. Corollas 5–12 cm long, white, blue, or purplish, not red.
5. Plants 1–1.5 m tall, leaf segments 10–60 mm long; peduncles 3–12 cm long during anthesis; corolla limb white or pale lavender

5. Plants to 1 m tall, leaf segments 3–25 mm long; peduncles 0.8–3.5(–8) cm long; corolla limb dark-blue or purplish \_\_\_\_\_ **I. sescossiana**
4. Stems herbaceous throughout. Leaf segments usually 5, filiform, 5–15 mm long, <1 mm wide. Corollas 3–4 cm long, lavender to red-purple \_\_\_\_\_ **I. capillacea**
3. Leaves rhombic, ovate or elliptic, or pedatisect at least on tips of mature branches.
6. Leaf blades 2–10 cm long, usually elliptic, rhombic or narrowly lanceolate, or rarely pedatisect on tips of mature branches. Sepals 6–8 mm long. Corollas 3–4 cm long. Capsules 5–6 mm in diameter, 3-locular \_\_\_\_\_ **I. madrensis**
6. Leaf blades to 2 cm long, rhombic, ovate or broadly elliptic. Sepals 4–6 mm long. Corollas <3 cm long. Capsules 7–8 mm in diameter, 2-locular \_\_\_\_\_ **I. plummerae**
2. Woody shrubs or trees, stems erect to spreading.
7. Corollas pink to lavender \_\_\_\_\_ **I. carnea**
7. Corollas white, often with a purplish center.
8. Leaves narrowly linear-lanceolate with long-attenuate tips. Youngest stems glabrous. High mountains in SE Sonora on the Chihuahua border \_\_\_\_\_ **I. chilopsidis**
8. Leaves more or less ovate or lanceolate, or if linear then the tips blunt. Youngest stems pubescent. Widespread in the state or west-central Sonora.
9. Trees often more than 4 m tall, with a well-developed trunk. Leaves 10–27 cm long, ovate. Widespread \_\_\_\_\_ **I. arborescens**
9. Shrubs to 2 (4) m with many stems from the base, lacking a well-developed trunk. Leaves to 8 cm long, lanceolate. Mountains in west-central Sonora \_\_\_\_\_ **I. seaania**
1. Twining or prostrate vines, herbaceous, annuals or perennials, sometimes lianas, but not woody shrubs or trees.
10. Leaves compound, pinnate, palmate, or pedate.
11. Leaves pinnately compound (pectinate), the segments filiform. Flowers red-orange \_\_\_\_\_ **I. quamoclit**
11. Leaves palmately or pedately compound.
12. Leaves palmate. Peduncles spiralled, very slender, and springy, often about 10 cm long. Corollas pink to lavender, 1.8–3 cm long, funnellform, rosy with the interior of the tube red-violate, glabrous \_\_\_\_\_ **I. heptaphylla**
12. Leaves pedatisect. Peduncles not spiraled. Corollas purple or lavender, if white then salverform.
13. Leaflets or the basal lobes profoundly incised, narrowly elliptic, more than 5 mm wide \_\_\_\_\_ **I. cairica**
13. Leaf segments linear to lanceolate or filiforme, often less than 3 mm wide.
14. Corollas <1 cm long \_\_\_\_\_ **I. costellata**
14. Corollas >1 cm long.
15. Leaves sessile, the segments usually 5, filiform, <1 mm wide \_\_\_\_\_ **I. capillacea**
15. Leaves mostly petiolate, less often sessile, the segments usually 5–11, linear to lanceolate, 0.5–6.5 mm wide.
16. Corollas 4.5–10 cm long, funnellform or salverform, completely white or white with pale rose to purple limb, the basal, narrow portion of tube >3 cm long, 2–6 mm in diameter \_\_\_\_\_ **I. tenuiloba**
16. Corollas 1.5–3.2 cm long, funnellform, purple, rarely white, throughout, the basal, narrow portion of tube 2–3 cm long, 2–3 mm in diameter.
17. Apex of leaf segments usually rounded. Outer sepals muricate, the tips obtuse to acute \_\_\_\_\_ **I. plummerae**
17. Apex of leaf segments usually acute. Outer sepals smooth or rarely muricate, the tips acute or attenuate \_\_\_\_\_ **I. ternifolia**
10. Leaves simple, entire, dentate, or deeply lobed, or occasionally basally pedatisect, usually cordate, obtuse to acute basally, entire, toothed, or palmately lobed sometimes linear to oblong.
18. Leaf blades acute to obtuse basally.
19. Leaf blades linear to oblong-lanceolate, 10–12(–20) cm long. Plants of inland regions \_\_\_\_\_ **I. longifolia**
19. Leaf blades sometimes linear to ovate or oblong, lobed or unlobed, the size and shape variable, 1.5–8 cm long. Plants of beaches \_\_\_\_\_ **I. imperati**
18. Leaf blade truncate to cordate basally.
20. Outer 2 sepals with a caudate or long-aristate apex. Corollas salverform.
21. Corollas red, rarely white, diurnal, 1.8–3 cm long.
22. Leaves pinnately compound (pectinate), the segments filiform \_\_\_\_\_ **I. quamoclit**
22. Leaves simple, entire, toothed, or lobed.
23. Sepals unequal; outer sepals oblong, 3–3.5 mm long, 2–2.5 mm wide, muricate or smooth, with a ± terminal arista 3–5 mm long; inner sepals oblong, 4–5.5 mm long, 3–3.5 mm wide. Capsules reflexed \_\_\_\_\_ **I. cristulata**
23. Sepals ± equal; outer two sepals oblong to elliptic, 1.3–5 mm long, 1.2–1.5 mm wide, smooth, with a ± terminal arista 1.6–6 mm long; inner sepals 2.5–3(–4) mm long, 1.5–2.5 mm wide. Capsules erect \_\_\_\_\_ **I. hederifolia**
21. Corollas white to lavender or purple, nocturnal, the tube 3–17 cm long.
24. Corollas 9–15 cm long, white \_\_\_\_\_ **I. alba**
24. Corollas 3–7.5 cm long, white when first open, lavender to purple by morning \_\_\_\_\_ **I. muricata**
20. Outer 2 sepals acute, acuminate to obtuse, but lacking a caudate or long-acuminate apex. Corollas campanulate, funnellform, or salverform.
25. Sepals 3–6 mm long, ovate to ovate-lanceolate, surface texture rugose to muricate on only the raised midrib. Corollas either campanulate or funnellform, blue with white or yellow throat.



26. Inflorescence often enclosed by the basal lobes of a leaf. Sepals ovate, more or less equal, rugose on outer surfaces. Corollas, with throat pale purple, the tube cream on the outside surface, interior yellow \_\_\_\_\_ ***I. aristolochiifolia***
26. Inflorescence separate from the basal lobes of a leaf. Sepals ovate-lanceolate, equal, with a thick, muricate, raised midrib. Corollas, with throat white, the tube greenish on the outside surface, interior yellow \_\_\_\_\_ ***I. cardiophylla***
25. Sepals usually much longer than 5 mm, shape and length variable, surface texture variable. Corollas funnelform or salverform, color mostly not different on the inner and outer surfaces.
27. Flower subtended by enlarged foliose bracts 1.8–4.3 cm long, 1.8–4.8 cm wide, persistent and pink \_\_\_\_\_ ***I. bracteata***
27. Flower subtended by scale-like or foliose bracts less than 1.8 cm long, cauducous or persistent, not enlarged and colored.
28. Corollas 4.5–13 cm long, salverform to funnelform-salverform.
29. Sepals unequal, the outer ones oblong-lanceolate, 5–11.5 mm long, 2–3 mm wide, the inner sepals 8–9 mm long. Corollas 4.5–10 cm long \_\_\_\_\_ ***I. tenuiloba***
29. Sepals ± equal, lanceolate, 12–15 mm long, 3–4 mm wide. Corollas 5–8 cm long \_\_\_\_\_ ***I. thurberi***
28. Corollas 0.6–9 cm long, funnelform or campanulate-funnelform.
30. Perennials. Stems prostrate-trailing. Mostly on beaches.
31. Sepals 1–1.5 cm long, unequal, oblong, the outer two shorter. Corollas white with a yellow throat, sometimes purplish within the base \_\_\_\_\_ ***I. imperati***
31. Sepals 0.5–1.1 cm long, equal or unequal, elliptic, ovate-elongate to orbicular. Corollas pinkish or lavender, the throat darker within \_\_\_\_\_ ***I. pes-caprae***
30. Annuals or perennials. Stems mostly twining (often prostrate in *I. batatas*). Inland plants.
32. Sepals more or less equal. Corollas 0.6–2 cm long.
33. Sepals (8–)10–14 mm long, the outer sepals lanceolate-acuminate, mucronate, typically glabrous. Corollas 0.6–1.5(–2) cm long, white to lavender, the throat often darker \_\_\_\_\_ ***I. x leucantha***
33. Sepals 6–7 mm long, the outer sepals oblong to narrowly elliptic-oblong, obtuse to acute, mucronulate-caudate, sparsely pubescent without, always conspicuously ciliate. Corollas 1–2 cm long, lavender \_\_\_\_\_ ***I. triloba***
32. Sepals mostly unequal, the outer ones shorter. Corollas 3–9 cm long.
34. Outer 2 sepals oblong, abruptly acuminate. Corollas white or lavender, the inner surface pubescent near the base \_\_\_\_\_ ***I. batatas***
34. Outer 2 sepals ovate to ovate-lanceolate, broadly elliptic to oblong, acute to obtuse. Corollas lavender to purple, the inner surface glabrous.
35. Sepals herbaceous, setaceous to hispid, trichomes with swollen bases.
36. Outer sepals basally ovate-lanceolate or narrowly ovate-lanceolate to elliptic, acute to abruptly acuminate apically \_\_\_\_\_ ***I. purpurea***
36. Outer sepals basally ovate with long attenuate tips.
37. Bracts foliaceous, resembling the sepals.
38. Bracts 5–6 mm long. Sepals 10–12 mm long, 1–2 mm wide, the bases slightly dilated, hispid-pilose throughout, the apex elongate narrowly linear, typically erect to spreading \_\_\_\_\_ ***I. barbatisepala***
38. Bracts 10–20 mm long (about as long as sepals). Sepals 10–20 mm long, 3–4 mm wide, the base not dilated, hirsute, the apex acuminate, glabrous and attenuate, reflexed to spreading \_\_\_\_\_ ***I. meyeri***
37. Bracts scale-like or caducous.
39. Sepals abruptly narrowed from the ovate base into a narrow linear-lanceolate apex, usually curved, at least in fruit, apex sometimes strongly curved, sepals densely long-hirsute at least on the basal 1/3. Corollas 2–3.7(–4.5) cm long, light blue, with the inside of the tube white or pale yellow \_\_\_\_\_ ***I. hederacea***
39. Sepals basally narrowly ovate, gradually tapering toward the apex, the tips straight, not curved, the base densely hispid to strigose on the upper parts, or distally glabrous. Corollas (2–) 3–6 cm long, purplish to blue, white or red (in cultivated plants) \_\_\_\_\_ ***I. nil***
35. Sepals coriaceous to chartaceous, if herbaceous, then lacking setaceous to hispid trichomes with swollen bases.
40. Sepals 1.5–2 mm long, accrescent to 5 mm in fruit. Corollas campanulate, yellow, glabrous \_\_\_\_\_ ***I. minutiflora***
40. Sepals 4–40 mm long. Corollas funnelform, white to lavender, blue or purple, glabrous or pubescent. \_\_\_\_\_ ***I. ampullacea***
41. Sepals 2.5–4 cm long \_\_\_\_\_
41. Sepals less than 2 cm long.
42. Outer sepals basally truncate to rounded, herbaceous.

43. Sepals more or less equal, white-pilose; outer sepal tips acute, not acuminate. Corollas blue to bluish, 5 cm long, 4–5 cm wide, the tube white \_\_\_\_\_ **I. decasperma**
43. Sepals equal or unequal, hirsute to hispid; outer sepal tips mostly acuminate, rarely acute. Corolla pink-purple to blue, 8–12 cm long, 6–12 cm wide.
44. Sepals more or less equal or the outer 2 slightly shorter, the outer triangular-ovate, 14–16 mm long, 6–8 mm wide, truncate to rounded at the broad base, apically acute to acuminate, hirsute. Corollas 8–12 cm long and wide, pink-purple, the outers surface pubescent \_\_\_\_\_ **I. laeta**
44. Sepals unequal, the outer ovate, 9–21 mm long, 5–11 mm wide, basally truncate, apically acuminate, the middle sepals asymmetrical, ovate, 9–19 mm long, 3–8 mm wide, acuminate, the inner sepals ovate-lanceolate, 9–20 mm long, 2–4 mm wide, antrorsely hispid, at times sericeous. Corollas 5.5–8 cm long, 6–7 cm wide, blue to violet, glabrous \_\_\_\_\_ **I. pubescens**
42. Outer sepals basally acute, coriaceous to chartaceous.
45. Sepals coriaceous.
46. Annuals. Stems usually with soft "prickles" (aculeae). Outer sepals more or less equal in length, more or less acute and cuspidate, with small appressed-puberulent indumentums \_\_\_\_\_ **I. parasitica**
46. Perennials. Stems without aculeae. Outer sepals unequal in length, acute to obtuse, glabrous or canescent.
47. Sepals ovate-lanceolate, broadly elliptic to oblong, 4–8.5 mm long, 3–6 mm wide, the outer sepals acute, the inner sepals obtuse to obtuse-mucronate, the outer muricate or more often with wings on the lower portion, glabrous or pubescent only toward the apex. Corollas slightly pubescent at the apices of the lobes \_\_\_\_\_ **I. pedicellaris**
47. Sepals broadly oblong to broadly ovate, 7–10 mm long, 4–6 mm wide, the outer broadly acute to obtuse, the inner rounded to obtuse, the outer smooth, the upper margins somewhat scarious, glabrous or the outer 2 sepals sericeous on the outer surfaces. Corollas glabrous \_\_\_\_\_ **I. scopulorum**
45. Sepals chartaceous.
48. Sepals 6–7 mm long, oblong to narrowly elliptic-oblong, obtuse to acute, mucronulate-caudate, glabrous or sparsely pubescent, always conspicuously ciliate. Corollas 1–2 cm long, lavender, glabrous inside \_\_\_\_\_ **I. triloba**
48. Sepals 8–15 mm long, oblong, abruptly acuminate, glabrous or pubescent. Corollas 4–7 cm long, lavender with a tube darker within or sometimes white, pubescent inside near the base \_\_\_\_\_ **I. batatas**

**Ipomoea alba** L., Sp. Pl. 1:161. 1753. TYPE: INDIA: "Munda-valli" in Rheede, Hort. Ind. Malab. 11:103. t. 50. f. 1–2 (1692) (LECTOTYPE!).

*Convolvulus aculeatus* L., Sp. Pl. 155. 1753. TYPE: CARIBBEAN: Plukenet, Phytographia t. 276, f. 3, 1694 (LECTOTYPE!). *Calonyction aculeatum* (L.) House, Bull. Torrey Bot. Club 31:590. 1904.

*Ipomoea bona-nox* L., Sp. Pl., ed. 2, 1:2.228. 1762. New name for both *I. alba* L. and *Convolvulus aculeatus* L. *Calonyction bona-nox* (L.) Bojer, Bull. Torrey Bot. Club 31:590. 1904.

#### MOONFLOWER

**Herbs**, perennial, twining, the stems with a base becoming somewhat woody, to 10 m or more, the stems usually aculeate or warty, at times rooting at the nodes, glabrous, rarely pubescent. **Leaves** 5–15 cm long and wide, broadly ovate to almost triangular, entire to 3–5-lobed, glabrous or rarely pubescent. **Inflorescences** monochasial or dichasial, axillary or terminal. **Flowers** 1–3 on glabrous peduncles. Sepals 10–15 mm long, ovate, apically acute and with a somewhat fleshy acumen or caudate extension. Corollas salverform, the tube 9–15 cm long, white with green lines within, the limb white with a star of 5 green lines, glabrous. **Capsules** 2–3 cm long, ovoid, tan to black, glabrous, 4-valved. Seeds 1–4, ovoid, 10–12 mm long, straw-colored to black, glabrous.  $2n = 30$ .

*Sonora*.—Secondary forests and margins, especially moist areas. Known from two Sonora records: North-

central Sonora in oak woodland, ca. 940 m, and southeastern Sonora in tropical deciduous forest at about 500 m. Flowering September–November.

*General distribution.*—Sinaloa southward and perhaps in all Mexican states; southeastern United States; Mesoamerica; Colombia, Venezuela, Guyanas, Ecuador, Perú, Brasil, Argentina; Caribbean. Often cultivated; native to tropical America. Flowering September–May.

Apparently first recorded in the New World by Oviedo (1526). This plant was probably first carried around the world for its medicinal seeds. Later it was spread for the nocturnal, fragrant flowers. Determining the region of nativity of this species within the New World is particularly difficult since it was carried from at least Cuba around the world in the early 1500s by the Spanish and probably the Portuguese. However, the center of diversity is tropical North America (McDonald 1993a). Typically, the plants are associated with wetlands, the seeds being distributed by water. Seeds arrive on the coasts of the British Isles with regularity, and surprisingly a few of them are viable and germinate. The occurrence in southern Sonora may be part of the native range, or may result from cultivated plants that have escaped.

**Mpio Álamos:** Canyon above Aduana, among rocks in shady canyon near water, 1 Nov 1939, *Gentry 4815!* **Mpio Cucurpe:** Floodplain near Rancho Agua Fria, E of Cucurpe, 940 m, *Van Devender 6 Sep 1976!*

***Ipomoea ampullacea*** Fernald, Proc. Amer. Acad. Arts 33:89. 1897. TYPE: MEXICO. GUERRERO: near Acapulco, Oct 1894–Mar 1895, *Palmer 483* (HOLOTYPE: GH!; ISOTYPES: K! US! (TROPICOS listed an isotype at NY, but it was not found there by Jackie Kallunki and Thomas Zanoni of NY, pers. comm. 2011).

Perennial **herbs** from a tuberous root, the stems woody below, retrorsely hispid. **Leaves** 8–10 cm long, almost as wide, cordate to broadly ovate, entire or 3-lobed, remotely appressed sericeous. **Inflorescences** dichasial, axillary. **Flowers** 1–4 on peduncles 10–12 mm long. Sepals 2.5–4 cm long, ovate, apically acuminate to obtuse, and becoming spatulate-attenuate with age, the outer ones appressed sericeous, the inner ones glabrous on the margins, sericeous on the dorsal regions. Corollas funnellform, white, 3–4 cm long, pubescent on the outer surface. **Capsules** 8–10 mm long and wide, almost globose, brown, glabrous. Seeds 1–4.

*Sonora.*—Known in the state from a single record in pine-oak forest, 1220 m. Flowering in September.

*General distribution.*—Sinaloa, Guerrero, Edo. Mexico, especially tropical deciduous forests. The occurrence of this species in pine-oak woodland in Sonora seems to be an anomaly as compared with its general distribution.

**Mpio Yécora:** Río Maycoba at MEX 16 (20.5 km W of Maycoba, 28.6 km E of Yécora), 28°22'15"N, 108°45'30"W, common, to 2 m in shrubs, 1220 m, 26 Sep 1998, *Reina-G. 98-1735!*

***Ipomoea ancisa*** House, Ann. N.Y. Acad. Sci. 18:187. 1908. TYPE: MEXICO. CHIHUAHUA: 22–24 Aug 1899, *Nelson 6276* (HOLOTYPE: US!; ISOTYPES: F!, incorrectly reported from NY). McDonald (2001: 80) mistook the “N” used by House (1908: 188) for an abbreviation for “NY” and considered that specimen the HOLOTYPE. In fact, House used “N” for what is now “US” (Smithsonian) and that is where the HOLOTYPE resides, although it is marked as an “isotype” on an annotation label.

#### ROMERIA DE LA SIERRA

Erect, suffrutescent **shrubby** perennials, 1–1.5 (2) m tall, the stems erect or ascending, glabrous. (John Palting, personal communication 28 September 2011, found the roots of a few plants to be deep and relatively thick but not tuberous.) **Leaves** ovate in outline, 3.5–11 cm long, 2–5 cm wide, irregularly pinnately divided into 6–9, obtuse-tipped divisions, the lobes linear to filiform, entire to irregularly toothed or lobed, 1–7.5 (8.7) cm long, 1–2 mm wide, glabrous; the petioles 7–15 mm long. **Inflorescences** of solitary (rarely 2) flowers. Flowers on peduncles 3–12 cm long, the pedicels 1–1.5 cm long, accrescent and recurved in fruit; fruiting peduncles and pedicels becoming somewhat woody; peduncles and pedicels with squamose, caducous bracts. Sepals unequal, the outer slightly shorter than inner, broadly elliptic to ovate, 6–10 mm long, 4–8 mm wide, smooth, obtuse or truncate, rarely acute, the margins scarious. Corollas funnellform, 5–12 cm long, white to pale lavender, the tube whitish, glabrous, the limb 4–7 cm wide. **Capsules** pear-shaped to ovoid, 1.5–1.8 cm long, 1.1–1.7 cm wide. Seeds 4, 7–10 mm long, ellilipsoid, gray-brown, puberulent.

*Sonora.*—A narrow endemic in mountains in eastern Sonora and western Chihuahua, 1220–1500 m in

Sonora and to ca. 2000+ m in adjacent Chihuahua. Juniper-oak woodland and pine-oak forest. Flowers and fruits July–September. This large morning glory, sometimes locally common, can be a spectacular sight towards the end of the summer rainy season with its many, large flowers open in early morning among the bright green, feathery foliage. John Palting (personal communication 30 Sep 2011) and Van Devender found it abundant in the Sierra de Bacadéhuachi in early Sep 2011. Palting wrote, “The stout plants in the sun were spectacular in bloom (100 flowers or more). Upon blooming the largest plants are a round mound about 3 feet high. They become more decumbent in the shade and bloom less. This is definitely a plant with high ornamental value.” The flowers produce jasmine-like fragrance.

Gentry (1942: 213) reported the herbage of *Ipomoea ancisa* in the upper Río Mayo region of Sonora and adjacent Chihuahua “is decocted and drunk for stomach ailments.”

Both *I. ancisa* and *I. sescossiana* are erect, shrubby perennials with pinnately compound leaves bearing very slender lobes, and are xenogamous with large bee-pollinated flowers (McDonald 2001). *I. sescossiana* occurs in Chihuahua and might be found in easternmost Sonora. Some specimens of *I. ancisa* from Sonora have been incorrectly attributed to *I. sescossiana*. The much smaller leaves and darker flowers readily distinguish *I. sescossiana*.

**Mpio Bavispe:** Río de Bavispe region, Piedra Parada, White 3672!; Cañón de Huépari, N of Aribabi, 4300 ft, White 2691! **Mpio Huachineras:** 4 mi (by road) N of Colonia Aribabi, 5000 ft, 5 Oct 1965, Turner 65-62! **Mpio Nacori Chico:** Ranchito Pinos Altos, Sierra Nacori, Robinson 2 Aug 69! **Mpio Yécora:** Along Hwy 16, 10.3 mi E of Yécora, 3.1 mi W of Arroyo Los Pilares crossing, 28°22.5'N, 108°49.5'W, 1475 m, 8 Sep 1995, Fishbein 2546!; Ejido Los Aserraderos, 28°0'40"N, 109°03'W, 1300 m, epithermal bleached soils, Martin 6 Nov 1986!; Arroyo Agua Caliente (La Soledad), 8 km S of Maycoba on road to Moris (Chihuahua), 28°19'40"N, 108°39'20"W, 1500 m, 26 Sep 1997, Van Devender 97-1263 (FTG-FAU!); 16.7 km NE of Yécora on MEX 16, grassland on rocky slope in oak woodland, 28°22'52"N, 108°49'33"N, 1410 m, uncommon 0.4–0.8 m tall shrub on rocky slope, flowers white with light pink outside on very base, open 9:00 a.m., fragrant jasmine odor, 2 Sep 2000, Van Devender 2000-633! **CHIHUAHUA: Mpio Janos:** Carreteras, border of Chihuahua and Sonora, flowers white, 26–28 Aug 1939, White 2552!

***Ipomoea arborescens*** (Humb. & Bonpl. ex Willd.) G. Don, Gen. Hist. 4:267. 1838. TYPE: MEXICO. GUERRERO: Inter Acaguisotla et Chilpancingo, Humboldt & Bonpland 3927 (HOLOTYPE: B-W-679, microfiche!; ISOTYPE: P, not seen). *Convolvulus arborescens* Willd., Enum. Pl. 1:204. 1809.

PALO SANTO, PALO BLANCO; TREE MORNING GLORY; JUTUGUO (Mayo)

**Trees** 3–15 m tall, the trunk to 50 cm diameter, the bark gray, whitish or yellowish, stems with abundant latex, tomentose when young with trichomes 0.1–2.5 mm long, becoming glabrescent. **Leaves:** blades often 9–19 cm long, 6–9 cm wide, ovate to lanceolate, often glabrescent or pubescent below (especially among var. *pachyleuta*) (velvety below particularly in the southern end of the range near Mexico City), the apex acuminate, the base cordate, with trichomes longer than those on the branches; petioles of larger leaves often 6–8 cm long. **Inflorescences** terminal or axillary, monochasial, racemose, forming compound-cymose clusters. **Flowers** in 1 (2) per cyme. Sepals 6–14 mm long, ovate to rarely orbicular, more or less equal, tomentose, the apex obtuse to obtuse-mucronate. Corollas 4–6 cm long, funnellform, tomentose at least on the lobes, white, with green, yellowish, or purplish within the tube. **Capsules** 17–25 mm long, 4-valvate, brown, glabrous. Seeds 1–4, 10–16 mm long, brown, pilose on the margins with trichomes 10–15 mm long.

Howard Scott Gentry (1942: 213) wrote, “A spectacular tree 7–10 m high, with smooth, white-gray bark like the hide of a hippopotamus. It flowers in winter when leafless, holding a high, thin spread of white corollas like stars against the morning sky. These stars soon fall upon the ground, where the deer eat them. With the summer rains, the tree forms dense foliage, which on the characteristically recurved branches is somewhat plumelike, especially from a distance.” The flowers an important early spring food source for migrating hummingbirds (Martin et al. 1998).

**Sonora.**—Sonoran desert, thornscrub, tropical deciduous forest, and lower oak and pine zones. These trees generally leaf out with the first summer-monsoon rains and fall away as the rains cease in fall, usually around September and October. Flowering during cooler months, when the trees are essentially leafless, mostly November–April and sometimes with a few flowers into May; near sea level–1100 m. The flowers open

in the late afternoon or early evening and may remain open much or all of the day during cooler weather. Many flowers, however, tend to fall before sunrise.

*General distribution.*—Mexico at least in Chiapas, Chihuahua, Guerrero, Jalisco, Michoacán, Morelos, Oaxaca, Puebla, Querétaro, and Sinaloa.

*Ipomoea arborescens* can be confused with *I. pauciflora* M. Martens & Galeotti of Mesoamerica. Farther south in its range, one may distinguish *I. arborescens* by the pubescent sepal and leaves that are silky pubescent below. However, in Sonora *I. arborescens* does not have those silky leaves. That paucity of indument led Gentry to recognize *I. arborescens* var. *glabrata*. There are two distinctive taxa in Sonora and adjacent Chihuahua and Sinaloa, which may warrant recognition as species. In Sonora the varieties apparently are allopatric, although in the vicinity of Aduana, near Álamos, they were observed growing intermixed in a disturbed tropical deciduous forest habitat.

*Ipomoea arborescens* has been used medicinally by the Guarijios and Mayos including a remedy for snakebite and to alleviate the pain of a scorpion sting, and also to treat toothache. The wood is burned to produce smoke to keep away mosquitoes. The soft, spongy, and moisture-rich wood is used as emergency fodder for cattle. It is chopped up for cattle feed (Gentry 1942, 1963; Yetman and Felger 2002; Yetman and Van Devender 2002). The Tepehuan used the wood in bows for violins (Pennington 1969). They also used the light-weight wood for foreshafts in the composite arrow.

*Selected references.*—Austin et al. (2005), Felger et al. (2001), Gentry (1942), Martin et al. (1998), Turner et al. (1995).

#### KEY TO VARIETIES

1. Sonoran desert to tropical deciduous forest and lower oak woodland. Bark of trunks light-colored, often appearing whitish or grayish white, but not yellowish. Flowers white with yellow or diffuse pale purple dots and short bands within the tube \_\_\_\_\_ ***I. arborescens* var. *arborescens***  
 1. Tropical deciduous forest and oak woodland. Bark yellowish. Flowers white with solid or almost solid dark purplish within the tube \_\_\_\_\_ ***I. arborescens* var. *pachylutea***

#### ***Ipomoea arborescens* (Humb. & Bonpl. ex Willd.) G. Don var. *arborescens***

*Ipomoea arborescens* var. *glabrata* Gentry, Publ. Carnegie Inst. Wash. Publ. 527:212. 1942. When Gentry made this combination he cited the correct protologue by Rose, but incorrectly listed A. Gray as the author. Since the varietal name by Rose transferred to *I. arborescens* was a later homonym of var. *glabrata* A. Gray, we are treating Gentry's action as a "new name." However, we consider var. *glabrata* to be a synonym of *I. arborescens* (Austin et al. 2005).

*Ipomoea murucoides* var. *glabrata* Rose, Contr. Natl. Herb. 1:107. 1891, not A. Gray (1887). TYPE: MEXICO. SONORA: Álamos, Mar 26–Apr 8, 1890, Palmer 316 (HOLOTYPE: US!, ISOTYPE: GH!).

PALO SANTO, PALO BLANCO; TREE MORNING GLORY; JUTUGUO (Mayo)

*Sonora.*—This variant is widespread through the range of the species (except where var. *pachyleuta* occurs) in the Sonoran desert, coastal and foothills thornscrub, tropical deciduous forest, and sometimes in lower oak zones; near sea level to ca. 1090 m. The flowers in Sonora are visited by bees, hawkmoths, and hummingbirds, and south of Sonora by bats.

*General distribution.*—Sonora southward to Chiapas including Sinaloa, Guerrero, Michoacán, Morelos, Oaxaca, and Puebla.

**Mpio Álamos:** San Bernardo, Lower and Tropical Sonoran, valleys, Palo Santo, tree 20 to 30 ft high with white-gray trunk and limbs, now leafless, holding a high spread of white corollas like stars against the morning sky, these stars soon fall upon the ground where the deer eat them, 23 Nov 1934, Gentry 1158! **Mpio Arizpe:** 10 km N of Sinoquipe on Son 89, foothills thornscrub, 30°14'13"N, 110°13'45"W, uncommon 4–6 m tree, 16 Sep 2000, Reina-G. 2000-726! **Mpio Bacadéhuachi:** 10 mi (by road) SW of Colonia Aribabi, 4000 ft, thorn forest, 5 Oct 1965, Turner 65-73! **Mpio Carbó:** 21 mi S (by road) of El Oasis, 12 Aug 1958, Turner 136! **Mpio La Colorada:** 13.4 km W of Tecoripa on Mex 16, Plains of Sonora desertscrub, 28°37'17"N, 110°05'30"W, 532 m, common 6–7 m tree, most in fruit but a few white flowers, 12 May 2008, Reina-G. 2008-147! **Mpio Cucurpe:** 14.2 km NW of Sinoquipe on road to Cucurpe, 30.19222°N, 110.35861°W, 29 Nov 2000, Reina-G. 2000-875! **Mpio Guaymas:** Microondas Avispas, Sierra Baviso, S end of Sierra Libre, 28°29'N, 111°02'W, 600 m, tree 6 m tall, 11 Aug 1985, Felger 85-815!; Cerro El Vigía, 420 m, shrub 4 m tall, 5 Sep 1980, Felger 80-17. **Mpio Hermosillo:** E of Batamote, ca. 45 km N of Hermosillo on Mex 15, Plains of Sonora desertscrub/foothills thornscrub, 29°29'09"N, 110°59'55"W, 515 m, common 4–6 m tree, flowers white with light yellow

low inside throat, open all day, 27 Dec 2000, *Reina-G. 2000-889!*; 5 mi N of Hermosillo, 900 ft, 23 Feb 1933, *Shreve 6066!* **Mpio Huatabampo:** Tierra y Libertad vicinity 5.4 km E of Camahuiroa on road to Diez de Abril, 3.75 km W-NW (by air) of Melchor Ocampo, 26.57500°N, 109.3000°W, flowers white with magenta centers, 25 Dec 1993, *Friedman 343-93 (ASU!)*. **Mpio Moctezuma:** Granitic hills 15.8 km NE of Mazocahui on road to Moctezuma, 975 m, in full leaf and sparse flower from summer rains, 5 Jul 1971, *Hastings 71-203!* **Mpio Ónavas:** Rancho La Mula, 5 km W of Agua Amarilla on Mex 16 (km 195 E of Hermosillo), tropical deciduous forest, 28°29'16"N, 109°21'59"W, 900 m, very common 3–10 m tall tree, flowers white with a little magenta in throat, 17 Feb 1993, *Reina-G. 97-118 (FAU-FTG!)*. **Mpio Opodepe:** Rancho Carrizal, foothills thornscrub on basalt slope with *Carnegiea*, *Stenocereus thurberi*, *Ipomoea arborescens*, 900 m, very common tree 3–5 m tall, flowers whitish w light pink tint deep inside throat (very few flowers), 22 May 2009, *Reina-G. 2009-211!* **Mpio San Miguel de Horcasitas:** Hills at first crossing of Río San Miguel S of Horcasitas, 18 Sep 1934, *Shreve 6696!* **Mpio Villa Pesqueira:** 3 mi (by road) S of Mazocahui, 1 Apr 1959, *Turner 59-63!*

***Ipomoea arborescens*** (Humb. & Bonpl. ex Willd.) G. Don var. ***pachylutea*** Gentry, Publ. Carnegie Inst. Wash. Publ. 527:213. 1942. TYPE: MEXICO. SONORA: Sierra de Álamos, Tropical Sonoran & Upper Sonoran, principally with the oaks, *palo santo amarillo*, Mex., tree with yellowish bark and heavy foliage, flower white with purple throat, 9 Feb 1937, *Gentry 3000* (HOLOTYPE: ARIZ!; ISOTYPES: ARIZ!, MO!, UC!, US!).

*PALO SANTO AMARILLO; TOCHIYÓ, TOCHIGUÓ* (Guarijío), *JUTUGUO* (Mayo)

Tree 7–8 m tall. Petioles, 3–7 cm long; blades often 8–18 cm long. This variety is distinct from the tautonymic *I. arborescens* farther south in its range, and may warrant taxonomic revision. The wood is harder than the lowland *I. arborescens*. See Austin et al. (2005) for details.

Tropical deciduous forest, oak woodland, pine-oak forest; 400–1200 m.

**Mpio Álamos:** Algodones, Sierra Charuco, high Tropical Sonoran and low Upper Sonoran, arroyos and slopes, *palo santo amarillo*, tree as high as 15 m, often slender and few-branched, bark yellow, wood harder than lowland *I. arborescens*, 21 Jul 1932, *Gentry 2299* (paratype!); 7.5 mi W of Álamos, 29 Jan 1964, *Krizman 13!*; Sierra de Álamos, rocky and canyon bottoms, 2000–3000 ft, *palo santo amarillo*, large trees with massive trunks & yellowish bark browning with age, 8–15 m high, petioles and twigs with milky juice, 4 Nov 1939, *Gentry 4888!*; 4 km SW of Santa Barbara, *Martin 15 Mar 1990!* **SINALOA. Mpio Badiraguato:** Las Mesas, Sierra Surotato, 25 Aug 1941, oak-*Ipomoea* savanna, volcanic ash, ca. 3000 ft, vernacular: *palo blanco*, tree with yellow bark, co-dominant with oak, 25 Aug 1941, *Gentry 6144!*

***Ipomoea aristolochiifolia*** G. Don, Gen. Hist. 4:277. 1838. TYPE: VENEZUELA: *Humboldt & Bonpland 679* (ISOTYPE: Bl, barcode: B-W-03661-01-0). *Convolvulus aristolochiifolius* Kunth, Nov. Gen. Sp. (quarto ed.) 3:102. 1819, not Mill. (1768).

*Ipomoea tuerckheimii* Vatke ex Donn.-Sm., Bot. Gaz. 40:8. 1905. TYPE: GUATEMALA: Alta Verapaz, *von Turckheim 386* (ISOTYPE: US!).

*Ipomoea austin-smithii* Standl., Publ. Field Mus. Nat. Hist. Bot. Ser. 18:566. 1938. TYPE: COSTA RICA: *Brenes 16899* (HOLOTYPE: F!).

*Ipomoea tweediei* of authors, not Hooker (1843).

*Ipomoea oocarpa* Benth., Bot. Voy. Sulphur 136. 1845. TYPE: ECUADOR: Guayaquil, *Sinclair s.n.* (HOLOTYPE: K!, photo F!).

*Ipomoea viscosa* Wiggins, Contr. Dudley Herb. 4:21, pl. 2. figs. 1–4. 1950. TYPE: MEXICO. SONORA: [Mpio San Pedro de la Cueva], between Tepopa and Batuc, corolla blue, peduncles viscid, stems trailing, 5–6 ft long, 28 Sep 1934, *Wiggins 7507* (HOLOTYPE: CASI; ISOTYPE: US!).

*Ipomoea peninsularis* Brandegee, Zoë 5:168. 1903. TYPE: MEXICO. BAJA CALIFORNIA [SUR]: W slope of cape region, Nov 1902, *Brandegee s.n.* (ISOTYPE: US!).

*Ipomoea cordata* L.B. Sm. & B.G. Schub., Contr. Gray Herb. 127:31–32. 1939. TYPE: MEXICO. GUERRERO: Coyuca, Cutzamala, 15 Nov 1934, *Hinton 6984* (ISOTYPE: US!).

Annual **herbs**, the stems twining, delicate, 1–3 m long, glabrescent to puberulent. **Leaves** 4–8(–10) cm long, cordate to ovate-cordate, entire, more or less glabrous. **Inflorescences** cymose, with flowers on long peduncles that pass between the basal lobes of the leaves. **Flowers** 1–6. Sepals 3–5 mm long, ovate, more or less equal, rugose on outer surfaces. Corollas 20–25 mm long, campanulate, the throat pale purple, the tube cream without, glabrous. **Capsules** 9–10 mm long, ovoid, brown, glabrous. Seeds 1–4, 4–5 mm long, black to brown, puberulent.

Recognized by the small pale flowers on peduncles that pass between the basal lobes of the leaves. Also, it is distinctive by having rugose sepals and small, lavender corollas.

**Sonora.**—Eastern Sonora, in Chihuahuan desert, oak woodland, and tropical deciduous forest; 180–1290 m. Flowering September–October.

**General distribution.**—Arizona; Baja California Sur, (probably in Chihuahua but no records found), Coahuila, Guerrero, Jalisco, Edo. Mexico, Michoacán, Morelos, Oaxaca, Sinaloa, Veracruz; Mesoamerica; Colombia, Venezuela, Ecuador, Perú, Bolivia, Brasil.

**Mpio Agua Prieta:** Isolated hill NE of Sierra Anibácachi, Rancho La Calera, ca. 10 km (by air) SW of Agua Prieta, 1287 m, 1 Oct 2005, occasional annual vine, *Van Devender 2005-1627!* **Mpio Álamos:** Rancho Mezquite Quate, Arroyo de Álamos, ca. 6 km (by air) SE of Álamos, rare annual, 300 m, 2 Oct 1992, *Bertelsen 92-133!*; Barranca Pozo Azul above junction with Arroyo Santa Bárbara, ca. 3 km S of Rancho Santa Bárbara (E-NE of Álamos), 900 m, oak woodland with tropical elements, solitary annual vine, sterile, 5 Oct 2006, *Van Devender 2006-1224!* **Mpio San Javier:** Cañón Lo de Campa, 28°32'N, 109°44'33"W, 480 m, 29 Sep 1996, *Varela-E. 96-361 (FTG-FAU!)*. **Mpio San Pedro de la Cueva:** Between Tepopa and Batuc, type of *I. viscosa* (above). **Mpio Soyopa:** Arroyo Los Garambullos, 0.5 km SE of Río Yaqui bridge on Mex 16, 3.3 km S, 1.5 km E of Tónichi, 28.5694°N, 109.55°W, 180 m, uncommon vine along river bank, flowers blue, drying purple, open at 7:00 a.m., 29 Sep 2000, *Van Devender 2000-750 (USON!)*.

***Ipomoea barbatisepala*** A. Gray, *Syn. Fl. N. Amer.*, ed. 2, 1:212. 1886. TYPE: U.S.A. TEXAS: *Wright 507* (HOLOTYPE: GH!, ISOTYPE: US!).

Annual **herbs**, the stems low-climbing, glabrous. **Leaves** orbicular-ovate in outline, 3–8 cm long, 1.5–8.5 cm wide, glabrous, with or without glandular dots, basally cordate, deeply 5–7 lobed, the lobes lanceolate and narrowed toward base, acute to acuminate; petioles 1–5.5 cm long. **Inflorescences** cymose, axillary. **Flowers** 1–3 on peduncles 2–6 cm long, glabrous or remotely appressed hairy, the pedicels 4–5 mm long, erect in fruit; bracts foliaceous, elliptic to linear, 5–6 mm long. Sepals ± equal, 10–12 mm long, 1–2 mm wide, lanceolate, with elongate narrowly linear tips typically erect to spreading in flower, reflexed in fruit, the bases slightly dilated, hispid-pilose. Corollas funnellform, 1.6–2(–2.5) cm long, glabrous, blue to light rosy-purple or white, the limb 1.8–2 cm wide, the throat yellow, glabrous. **Capsules** glabrous, 8–9 mm long, rounded, apiculate, 2–3-locular. Seeds 1–6, 4–5 mm long, pyriform, dark brown to black, appressed pubescent.

**Sonora.**—Desert grassland, thornscrub, tropical deciduous forest, and oak woodland; 200–1300+ m. Flowering at least August–September.

**General distribution.**—Arizona, New Mexico, Texas; Baja California Sur, Sinaloa, disjunct to Oaxaca. Flowering July–December.

In many ways this species resembles *I. hederacea*, which may grow with it, but *I. barbatisepala* is more delicate, more of the leaves are lobed, and the corollas are typically smaller. The two have sepals that are almost identical, but the pubescence is mostly near the base in *I. hederacea* and extends all the way to the tip in *I. barbatisepala*.

**Mpio Bavispe:** Arroyo Pulpito, near Colonia Oaxaca, 30 Jul 1938, *White 746!* **Mpio Ímuris:** 10 km NE of Ímuris on MEX 2, 1300 m, desert grassland, abundant on roadside, flowers magenta with white throat, closed at 11:30 a.m., mesquite scrub on slope, 15 Sep 2000, *Van Devender 2000-696!* **Mpio Navojoa:** Near Masiaca, Río Mayo, 200 m, 8 Oct 1992, *Van Devender 92-1126!* **Mpio San Javier:** 5 km E of turnoff to San Javier on Mex 16, 28.5481°N, 109.7231°W, 560 m, tropical deciduous forest, uncommon annual on roadside, flowers blue, throat with white, sepals drying purple, open 7:20 a.m., 29 Aug 2000, *Van Devender 2000-463 (USON!)*. **Mpio Yécora:** 1.9 km W of Tepoca, 675 m, 22 Sep 1997, *Van Devender 97-1016!*

***Ipomoea batatas*** (L.) Lam., *Tabl. Encycl.* 1:465. 1791. TYPE: INDIA: herb. Linnaeus (LINN-77.5 S!). *Convolvulus batatas* L., *Sp. Pl.* 154. 1753.

*Batatas edulis* (Thunb.) Choisy, *Mem. Soc. Phys. Genève* 6:435. 1834. TYPE: JAPAN: *Thunberg* (HOLOTYPE: UPS!).

*Ipomoea triloba* of authors, not L.

CAMOTE; SWEET POTATO

**Perennial herbs**, the stems twining or prostrate, to 5 m or more, pubescent with appressed to erect trichomes, less often glabrous. **Leaves** 5–10 cm long, broadly ovate to cordate, entire to dentate or 5–7-lobed, the apex acuminate, glabrous to pubescent. **Inflorescences**, axillary, in monochasia or dichasia. **Flowers** (1–)3–∞. Sepals unequal, 8–15 mm long, oblong, the two outer shorter than inner and abruptly acuminate, glabrous or pubescent. Corollas (3–)4–7 cm long, funnellform, lavender or sometimes white, with a tube darker within, pubescent within near the base. **Capsules** infrequent, 4–5 mm long, rounded, brown, pubescent or glabrous. Seeds 1–4, 3–4 mm long, tan to brown, glabrous.  $2n = 60, 84, 90$ .

**Sonora.**—Cultivated in gardens and occasional found in the southern margin of the Sonoran desert, coastal and foothills thornscrub, and tropical deciduous forest, especially in disturbed areas in densely vegetated areas such as washes. Flowering at least March, April, September, and October.

**General distribution.**—Mexico; Central America; Argentina, Bolivia, Brasil, Chile, Colombia, Ecuador,

Guyanas, Perú, Paraguay, Uruguay, Venezuela; Caribbean; a pantropical cultigen. Potentially flowering all year if not harvested.

*Selected references.*—Austin (1978), Bohac et al. (1993, 1995).

**Mpio Álamos:** El Rancheria crossing of Río Cuchujaqui, ca. 22.5 km S of Álamos on road to El Chinal, 26.85°N, 108.917°W, 200 m, common annual on dense bank in tropical deciduous forest, flowers pink, 10 Oct 1992, *Van Devender 92-1146* (ASU!). **Mpio Guaymas:** Guaymas, *Chan & Folkner 25 Apr 1960!*; 1.3 mi S of Mex Hwy 15 on road to Las Guásimas, 8 m elev., in shrubs and trees along drainageway, petals pink with magenta center, rare, 9 Oct 1985, *Felger 85-1160!* **Mpio Huatabampo:** 6.8 km S Camahuiroa, 10 km W-SW Melchor Ocampo, 26.5389°N, 109.292°W, 10 m, common perennial vine in trees to 4 m, flowers purple, 20 Oct 1994, *Friedman 438-94* (ASU!).

***Ipomoea bracteata*** Cav., *Icon.* 5:51, t. 477. 1799. TYPE: MEXICO, GUERRERO; *Nee s.n.* (ISOTYPES: MA, photo!). *Exogonium bracteatum* (Cav.) Choisy ex G. Don, *Gen.* 4:264. 1838.

JICAMA; CA'MORI (Guarijío); TOSAGÜTRA (Mayo)

**Lianas**, perennials, the stems twining, 2–6 m long, glabrous or less often lightly hirsute to strigose. **Leaves** 1.5–9.5 cm long, 1.2–7 cm wide, ovate, basally cordate, at times undulate or with small marginal teeth, apically acuminate or mucronulate, glabrous or slightly pubescent; petioles 1–2.5 cm long. **Inflorescences** solitary or in terminal monochasial capitula—forming specacular upright to pendent sprays several to more than 30 cm long with bright pink-purple bracts and darker-colored flowers. **Flowers** (1)2–7, on peduncles greatly reduced, to 2 mm long, the pedicels to 2 mm long; bracts foliose, ovate, 1.8–4.3 cm long, 1.8–4.8 cm wide, persistent, herbaceous, pink-purple, glabrous, the apex acute to obtuse, mucronate. Sepals ± equal or the inner ones slightly longer than the outer ones, 6–9 mm long, 2–3 mm wide, glabrous, chartaceous to membranaceous, the margins scarious, the apex acute to obtuse, aristate. Corollas 2.5–3.8 cm long, 4–7 mm wide, salverform, glabrous, magenta, rose, or (rarely) greenish. **Capsules** 6–19 mm long, 4–8 mm wide, glabrous, conic, brown, 1 or 2 locular. Seeds 1(2), 4–5 mm long, 2–3 mm wide, rounded, brown, puberulent.

**Sonora.**—Coastal and foothills thornscrub, tropical deciduous forest, and oak woodland in southern and central Sonora; near sea level–1020+ m. Often flowering when leafless or nearly so in winter and dry seasons, at least December–May.

As the common name *jicama* (from Nahuatl *xicama* or *xicamatl*, where *camatl* refers to the mouth) suggests, the roots are eaten like those of the legume (*Pachyrhizus erosus*) called by the same name (Gentry 1942; Standley 1920–1926). *Ipomoea bracteata* is as an indigenous food resource in the Río Mayo region of southeastern Sonora. “The tuberous roots are in high repute among the natives for their edibility, ‘like yams’, but they are deep and hard to dig out” (Gentry 1942: 218). The root is reported to be sweet and was widely eaten. The vine has been used extensively as rope or twine to secure bundles. It is said to twist well and be long lasting (Yetman & Van Devender 2002).

**General distribution.**—Baja California Sur, Chihuahua, Guanajuato, Guerrero, Jalisco, Edo. México, Michoacán, Morelos, Nayarit, Oaxaca, Sinaloa, Veracruz.

This species reminds some of *Bougainvillea* (Nyctaginaceae), hence the name ‘bugambilia’ in southern Mexico. However, the similarity is superficial as *I. bracteata* is adapted for bird pollination and *Bougainvillea* for moths. The two share only colored bracts.

**Mpio Álamos:** San Bernardo, 10 Feb 1935, *Gentry 1293!*; Caramechi, 3–10 Dec 1934, Lower Sonoran, arroyos, *hicama*, Mex, *hamoli*, vine running 20 feet or more up on trees and shrubs, roots edible, *Gentry 1172* (ARIZ!, MO!). **Mpio Arizpe:** 10 km (by air) WNW of Sinoquipe, 30°10'52"N, 110°20'26"W, 948 m, rocky slope, foothills thornscrub, 3 Apr 2012, *Van Devender 2012-370*. **Mpio Guaymas:** Yaqui Region, 8 mi by road NE from Mex Hwy 15 at Estacion Vicam, 190 ft, rich coastal thornscrub, shaded arroyo on N-facing bank, not common, 12 Mar 1989, *Felger 89-90!* **Mpio Hermosillo:** La Pintada, 49 km al S de Hermosillo por la Carr. Fed. 15, 28.5833°N, 110.9617°W, 250 m, enredadera grande, flores tubulares pequeñas encerradas por una gran bractea de color rosa brillante, en invierno cuando no tiene hojas, 18 Apr 1993, *Búrquez 93-51* (USON!). **Mpio Huatabampo:** 500 m N-NE Camahuiroa, 26°32'55"N; 109°16'45"W, 5 m elev, uncommon vine to 4 m, bracts pink, 16 Mar 1994, *Friedman 32-94* (ASU!). **Mpio Navojoa:** Cerro Prieto, 15 km E of Navojoa, 27.0847°N, 109.2583°W, 17 Apr 1993, *Wiens 93-010!* **Mpio Ónavas:** Agua Amarilla (Los Pinitos), 15 km W-NW of San Nicolás on Mex 16, 28.4858°N, 109.3589°W, red volcanic barren with relict *Pinus durangensis-Quercus albocincta* woodland, 900 m, 11 Mar 1996, *Van Devender 96-35!* **Mpio Rosario:** 19 mi N of Tezopaco, 1230 ft, 25 Mar 1975, *McLaughlin 499!* **Mpio San Javier:** Rd to San Javier off Hwy 16, 13 Mar 1989, *Rondeau 89-100!* **Mpio San Pedro de la Cueva:** Rancho El Paraje del Bichi, 9.4 km W of Rancherías on road to San Pedro de la Cueva, Sierra Las Acequias, 29.28°N, 109.6728°W, 744 m, locally common, flowers purple, foothills thornscrub, 27 Apr 2004, *Reina-G. 2004-445!* **Mpio Tepache:** Arroyo Rancheria, 14.6 mi by rd



S of Tepache, 560 m, 25 Apr 1971, Turner 71-58! **Mpio Yécora:** Arroyo San Nicolás, E of Tepoca, Monson 12 May 1988!; 3 km ENE de San Nicolás sobre el camino a Yécora (Sonora 16), 29.452°N, 109.15806°W, hierba trepadora, perenne, brácteas y flor lila, 7 May 1995, Reina-G. 95-266 (USON!). **Mpio Ures:** 10 km W-SW of Mazocahui on SON 89, foothills thornscrub/tropical deciduous forest transition, 29°30'02"N; 110°10'20"W, 715 m, 29 Nov 2000, Reina-G. 2000-879!

\****Ipomoea cairica*** (L.) Sweet, Hort. Brit. 2:287. 1826. *Convolvulus cairicus* L., Syst. Nat. ed. 10, 922. 1759. "Convolvulus Aegyptius" Vesling en Alpinio, Pl. Aegypti 73 & 74 (1640) (LECTOTYPE!).

**Perennial** vines, the stems to 5 m or longer, twining but also lying on the ground, glabrous. **Leaves** 3–10 cm long, 3–10 cm wide, glabrous, ovate to orbicular, palmately divided to the base into 5-lobes, these lanceolate or ovate-lanceolate to ovate or elliptic, the basal segments acuminate, the two basal segments generally lobulate or otherwise parted, mostly with pseudostipules (small leaves from the axillary buds at the base of the petiole), acute to obtuse at the apex. **Inflorescences** cymose. **Flowers** 1 to few. Sepals 4–6.5 mm long, more or less equal, or the outer sepals slightly shorter, ovate, obtuse to acute, the inner sepals wider, obtuse, glabrous but frequently somewhat tuberculate. Corollas 4.5–6 cm long, rarely shorter, funnellform, usually blue-purple or white, with a reddish-purple throat, glabrous. **Capsules** 1–1.2 cm long, more or less globose, straw-colored or brown, glabrous. Seeds 1–4, globose, 5–6 mm long, brown, densely short tomentose or at times also with long silky trichomes on the margins.

**Sonora.**—Known from one collection from 1939. Due to wide naturalization in other parts of the world the species is included. Future searching may reveal additional records for Sonora.

**General distribution.**—Naturalized in Alabama, Florida, Louisiana; cultivated in Arkansas, California, Texas?; Mexico (at least in Oaxaca); South America; West Indies; Africa; Asia; Australia. Cultivated in the tropics and subtropics around the world; nativity uncertain, perhaps Africa.

**Mpio. Álamos:** Álamos, cultivated ornamental on back fence, reported as native to the mountains E of Álamos, 29 Oct 1939, Genry 4782 (MO!).

***Ipomoea capillacea*** (Kunth) G. Don, Gen. Syst. 4:267. 1837. TYPE: COLOMBIA: between San Miguel and Río Pures, Nov 1801. Humboldt & Bonpland s.n. (HOLOTYPE: P, microfiche seen, PHOTOS F!, GH!; ISOTYPES: P(2)!). *Convolvulus capillaceus* Kunth, Nov. Gen. Sp. Pl. 3:97. 1819.

*Ipomoea muricata* Cav., Icon. 5:52. 1799, not Jacquin (1798). TYPE: MEXICO. GUANAJUATO: Ocl, Cavanilles s.n. (HOLOTYPE: MA!; ISOTYPE: MA!). *Ipomoea muricatisepala* Matuda, Ann. Inst. Biol. Méx. 34:124. 1964. New name for *I. muricata* Cav.

**Perennial herbs** with erect to ascending glabrous stems, from an underground elongate tuber. **Leaves** with blades sessile, incised and appearing compound, the segments usually 5, filiform, 5–15 mm long. **Inflorescences** axillary, solitary. **Flowers** on peduncles 5–7 mm long, the pedicels 3–6 mm long, reflexed in fruit. Sepals ± equal, 5–6 mm long, the outer one 2 mm wide, the inner ones 3 mm wide, acute to obtuse and mucronate apically, the outer sepals elliptic to oblong, the inner sepals ovate, muricate-tuberculate at least on the midvein. Corollas 3–4 cm long, funnellform, lavender to reddish purple, the limb 2–2.5 cm wide, glabrous. **Capsules** ± globose, glabrous, 4–5 mm wide, apiculum 1 mm long. Seeds 1–4, 3 mm long, ovoid, black to dark brown, shortly erect hispid.

**Sonora.**—Oak woodland and pine-oak forest in eastern Sonora; 1100–2100 (to 2500 m in nearby SW Chihuahua). Flowering August–October.

**General distribution.**—Arizona, New Mexico, Texas; Baja California (norte) and Sur, Chihuahua, Coahuila, and southward to Puebla; Central America; South America.

See comments under *I. muricata* and also *I. plummerae* for potentially confusing species.

**Mpio Álamos:** Sierra de Álamos, 1200 m, 20 Aug 1994, Steinmann 94-74!; Vallecito, 3 km SW of Santa Bárbara, 1100 m, Martin 4 Oct 1990!

**Mpio Cananea:** Hwy 2, S of Cananea, in hills, 1372–1585 m, south-facing steep hill, oak grassland, perennial from tuber, to 1 ft, slightly twining on tips, flowers magenta, narrowly funnellform to 3 cm, sepals muricate/tuberculate, 26 Aug 2003, Kamp 445 (COCHISE!). **Mpio**

**Naco:** San José Mountains, 3 Aug 1893, Mearns 1628 (US, not seen, cited by McDonald 1995). **Mpio Nacozari de García:** El Tajo, Río Fronteras, 20 Aug 1941, White 4059 (GH, specimen not relocated, cited by McDonald 1995). **Mpio Yécora:** Arroyo Otro Lado, 1–2 km NNE of Yécora, 1520 m, 28°23'49"N, 108°54'48"W, 7 Sep 1995, flowers purple, Van Devender 95-840!; Mesa de los Coronados, S side of Mesa del Campanero, 28°19'30"N, 109°01'40"W, 2100 m, flowers pink, 1 Sep 2000, Van Devender 2000-585!; Mesa el Campanero, Arroyo Largo, tributary of Barranca El Salto, pine-oak forest, 2000 m, 6 Sep 1996, Van Devender 96-396!

***Ipomoea cardiophylla*** A. Gray, Syn. Fl. N. Amer., ed. 2, 1:213. 1886. TYPE: U.S.A. TEXAS. Hudspeth Co.: Hueco Mts., E. of El Paso, 13 Oct 1849, Wright 511 (HOLOTYPE: GH!). According to McDonald (1982) the locality and collection number are from Wright's field notes discussed by Johnson (1940).

*Ipomoea aristolochiifolia* of authors, not G. Don (1838).

Annual **herbs**, glabrous, the stems twining, 1–5 m long, branching, green or red, smooth or with small warts on stems. **Leaves** with blades 2.4–5.5 cm long, 3.2–6.7 cm wide, ovate, entire, apically acuminate, attenuate, membranous, basally cordate, with petioles 1.2–10.3 cm long. **Flowers** monochasial, dichasial, or solitary. Sepals 4–6 mm long, 1.5–2 mm wide, equal, ovate-lanceolate, acute, with a thick, muricate, raised midrib, margins hyaline. Corollas 2–3 cm long, funnellform, dark blue, the throat white, the interior yellow, glabrous. **Capsules** 6–12 mm long, ovoid, tan brown when dry, glabrous. Seeds 4, 4–6 mm long, ellipsoid, dark brown-black, puberulent.

**Sonora.**—This is a Chihuahuan desert species and is likely to occur in northeastern Sonora. It has been found within less than 10 km of Sonora, in the Mule Mountains near Bisbee in southeastern Arizona.

**General distribution.**—SE Arizona, SW New Mexico, W Texas; Chihuahua, Coahuila, Durango, Guanajuato, Nuevo Leon, Oaxaca, San Luis Potosi.

Andrew McDonald (1982: 259–261) rediscovered this species in Texas and it was later realized that it also occurred in Arizona (Mason et al. 1986). Austin (1991, 1992, 2006) subsequently discussed the species in Arizona. Unfortunately, the distribution map in Austin (2006: 95) has the legend reversed on *I. cardiophylla* and *I. aristolochiifolia*.

**U.S.A. ARIZONA. Cochise Co.:** Mule Mountains, N of hwy between Huachuca Terrace and Palominas, 8 Sep 1961, Goodding 206-61!; 5 mi S of Tombstone, Walker 24 Sep 1975!; US 80, 5.4 mi S of Tombstone city limits, just N of mile post 324, limb blue, throat yellow, fibrous root system, generally rare, but locally abundant, limb mostly wilted at 11 a.m., 4000 ft, 7 Sep 1989, Austin 7608 (ASU!).

\****Ipomoea carnea*** Jacq. subsp. ***fistulosa*** (Mart. ex Choisy) D.F. Austin, Taxon 26:237. 1977. TYPE: BRAZIL: Martius 2398 (LECTOTYPE: M!). *Ipomoea fistulosa* Martius ex Choisy in DC., Prodr. 9:349. 1845.

*Ipomoea carnea* Jacq., Stirp. Amer. Hort. pl. 18. 1763, as to species, not variety. TYPE: COLOMBIA: Cartagena, illustration by Jacquin pl. 18. 1763 (LECTOTYPE!).

*Batatas crassicaulis* Benth., Bot. Voy. Sulphur 134. 1845. TYPE: ECUADOR. GUAYAS: Guayaquil, Sinclair s.n. (HOLOTYPE: K!). *Ipomoea crassicaulis* (Benth.) B.L. Rob., Proc. Amer. Acad. Sci. 51:530. 1916.

**Shrubs** 1.5–2+ m (typically erect and free-standing; sometimes to 4 m outside of Sonora), puberulent or less often glabrous, with milky sap, stems becoming woody, hollow when dry. **Leaves** 10–25 cm long, often almost as wide, entire, broadly ovate, ± orbicular to lanceolate, apically acuminate to somewhat obtuse, puberulent to glabrescent. **Inflorescences** monochasial or dichasial. **Flowers** 1–∞, on peduncles glabrous or pubescent. Sepals 3–7 mm long, ± orbicular, the apices rounded, glabrous or more often puberulent. Corollas 4–8 cm long, funnellform, usually rosy-purple to lavender, less often white, with a darker purplish throat, pubescent without. **Capsules** 1.3–2 cm long, conic, brown, glabrous. Seeds 1–4, 10–12 mm long, ellipsoid, dark brown to tan or gray, woolly with dark gray to brown trichomes.  $2n = 30$ .

**Sonora.**—Widely cultivated across the lowland regions of Sonora and rarely escaping, such as in coastal thornscrub and tropical deciduous forest, near sea level–270 m. Flowering at almost any time of year; near sea level to at least 420 m in cultivation.

**General distribution.**—This subspecies is planted as an ornamental in many warm and tropical dry regions of the World including: Arizona, California, Texas; Chiapas, Chihuahua, Guerrero, Jalisco, Michoacán, Morelos, Nayarit, Oaxaca, San Luis Potosí, Sinaloa, Tamaulipas, Veracruz; Mesoamerica; Brazil, Bolivia, Colombia, Paraguay, Peru, Venezuela; Caribbean. It is probably native at least to the Amazon basin in South America.

Subspecies *fistulosa* differs from subsp. *carnea* in having lanceolate leaves and being a shrub rather than a liana, and subsp. *carnea* is not in cultivation.

**Mpio Álamos:** NW edge of El Mesquital, 5.6 km SE of Río Cuchajaqui on road to Güirocoba, escaped cultivar, 270 m, 23 Sep 1994, Van Devender 94-771! **Mpio Gen. Plutarco Elias:** Quitovac, cultivated in dooryard garden of Papago family, 1 Jan 1982, Nabhan 295! **Mpio Her-**

**mosillo:** Hermosillo, 29.075°N, 110.983°W, 190 m, 2 m shrub in yard, flowers lavender, open at 9:00 a.m., 17 Sep 2000, *Van Devender 2000-740* (USON!). **Mpio Navojoa:** Estación Don on MEX 15, La Jaula (S of Navojoa), 2 Dec 2007, *Reina-G. 2007-1116!*

***Ipomoea chilopsidis*** Standl., *Publ. Field. Mus. Nat. Hist. Bot. Ser.* 17:206. 1937. TYPE: MEXICO. CHIHUAHUA: Guasaremos, Río Mayo, Upper Sonoran; oak and pine rims, shrub two to five m high, few and irregularly branched, flowers white with purple throat, singularly of the high and arid crags, 16 Aug 1936, *Gentry 2391* (HOLOTYPE: F!; ISOTYPES: ARIZ 76041!, 273794! MO!, K!, US!).

Multiple-stem small **trees** and large **shrubs** 2–5 m tall, the stems broadly ridged on drying, glabrous. **Leaves** mostly 10–17.5(–20) cm long, 0.5–1.3 cm wide, with 18–30 pairs of secondary veins, entire, linear, apically acute, basally cuneate, glabrous; petiole 0.5–1.2 cm long. **Inflorescences** monochasial, terminal on reduced branches. **Flowers** 1(–3) on peduncles 0.4–2.2 cm long, glabrous except inner surfaces of sepals. Sepals 12–16 mm long, 7–9 mm wide, ovate, about equal or the outer ones slightly shorter than the inner ones, apically obtuse to acute, the inner surfaces short-pubescent. Corollas 8–9.5 cm long, 8–9 cm wide, funnellform, white with a purple throat. **Capsules** 18–22 mm long, conic, brown, glabrous. Seeds often 4, 10–15 mm long, oblong, brown, woolly with long trichomes on the ventral margins.

**Sonora.**—High and arid rock ridges and on indurated ash in woodland, often with *Acacia pennatula*, *Dodonaea viscosa*, and *Quercus chihuahuensis*; 1000–1300 m. Flowering documented May–November.

**General distribution.**—Oak woodland in southeastern Sonora and southwestern Chihuahua; 1000–1800 m.

The leaf shape of this shrub makes it unique among the *Ipomoea* in the Americas. As the species name indicates, the leaves resemble those of *Chilopsis linearis* (Bignoniaceae).

**Mpio Álamos:** Sierra Saguaribo, 1 km E of El Chiribo, in *Dodonaea*-dominated scrub, 1300 m, 24 Aug 1992, *Steinmann 93-284!*; 5 km SW of Santa Bárbara, 27°05.5'N, 108°45'W, indurated ash with *Dodonaea* and *Quercus chihuahuensis*, 1100 m, large white bell-shaped flowers near the top of a 4 m tall shrub with multiple stems 14 May 1990, *Jenkins 90-162* (ARIZ!, UCR!); Mesa la Lagunita, 27°58'20"N, 109°06'30"W, basalt soil, 1100 m, *Martin & Clothier 6 Nov 1986!* **CHIHUAHUA. Mpio Batopilas:** Barranca de Batopilas near Creel–La Bufa road, N rim of canyon, 8.3 km by road above canyon-bottom bridge, ca. 5000 ft, 9 Jun 1963, *Felger 8078b!*; Barranca de de Batopilas, 5 mi S of Quirare, rocky semi-tropical scrub, 5000 ft, 21 Aug 1967, *Marin CF39* (UCR!); La Bufa, canyon Río Batopilas, short tree forest, barancan oak forest, 3300–3600 ft, near dwellings and trail between old and new settlement, 10 Aug 1971, *Bye 1977* (UCR!); Sierra Madre Occidental between Creel and La Bufa, canyon of Río Batopilas, on canyon floor near mouth of creek called Arroyo San Fernando, 3330–4180 ft. 27 Jun 1982, *Siplivinsky 3999* (UCR!).

***Ipomoea costellata*** Torr., *Bot. Mex. Bound.* 149. 1859. TYPE: U.S.A. TEXAS: *Wright 505* (LECTOTYPE: GH!, ISOLECTOTYPES: F!, BM!, MO!, NY!, US!).

*Ipomoea futilis* A. Nelson, *Univ. Wyoming Publ. Sci.* 1:65. 1924. TYPE: U.S.A. ARIZONA: *Hanson 1016* (RM!).

*Ipomoea pusilla* Brandege, *Univ. Calif. Publ. Bot.* 4:382. 1913. TYPE: MEXICO. VERACRUZ: *Purpus 6152* (HOLOTYPE: UC!; ISOTYPES: F!, GH!, NY!, PI!, US!).

**Herbs**, annual, from a slender taproot; stems erect at first, in age trailing or twining at the tips, 2–3 m long, glabrous. **Leaves** with blades ± sessile or on petioles 1–3 cm long, deeply palmately divided with the lateral divisions two-cleft (pedatisect), the segments 5–9, linear or linear-lanceolate, 7–25 mm long, glabrous. **Inflorescences** mostly solitary, axillary. **Flowers** on peduncles 1–3(–7) cm long, the pedicels 15–25 mm long, erect in fruit. Sepals slightly unequal, the outer ones 3–5 mm long, 1–2 mm wide, the inner ones 4–6 mm long, 2–3 mm wide, oblong-lanceolate, acute, mucronulate, scarious margined, at least the inner slightly rugose along the veins. Corollas 10–12 mm long, 5–10(14) mm wide, pale lavender to pink, usually with a white throat. **Capsules** ± globose to ellipsoid-globose, 4–5 mm wide, with a 1–2 mm caducous apiculum, tan, glabrous. Seeds 3 or 4, 3 mm long, ovoid, black, glabrous.

**Sonora.**—Southern and eastern margins of the Sonoran desert, Chihuahuan desert, grassland, coastal and foothill thornscrub, tropical deciduous forest, oak woodland, and pine-oak forest; 50–1550+ m. Flowering August–November.

**General distribution.**—Arizona, New Mexico, Texas; Baja California Sur, Chihuahua, Coahuila, Nuevo León, Tamaulipas south to Chiapas; introduced into South America.

This widespread species is self-fertilizing (McDonald et al. 2011); indicators are the annual habit and the inconspicuous small flowers.

**Mpio Agua Prieta:** Hill NE of Sierra Anibácachi, Rancho La Calera, 10 km (by air) SW of Agua Prieta, 31.2330°N, 109.6314°W, 1287 m, Chihuahuan desertscrub, very common annual vine on limestone slope, flowers lavender with white throat, 12 Aug 2006, *Reina-G. 2006-405!* **Mpio Álamos:** Arroyo Menditero at crossing of Álamos–El Chinal road & down to río Cuchujaqui, 12 km (airline) S of Álamos, near 26°54'48"N, 108°55'W, 2450 m, tropical deciduous forest on slopes, 5 Oct 1992, *Sanders 12611* (UCR!); Arroyo Guajaráy, 19 Mar 1993, *Steinmann 93-151!* **Mpio Bacadéhuachi:** 9.7 km (by air) E of Bacadéhuachi, Sierra de Bacadéhuachi, 29°47'47"N, 109°02'05"W, 1151 m, desert grassland, uncommon vining annual; flowers lavender, 3 Sep 2011, *Reina-G. 2011-476* (USON!). **Mpio Bavispe:** Arroyo Pulpito, near Colonia Oaxaca, 3 Aug 1938, *White 761!* **Mpio Cucurpe:** 19 mi E of Magdalena, 12 Sep 1934, *Shreve 6642b!*; Near Rancho Agua Fria, E of Cucurpe, *Van Devender 6 Sep 1976!* **Mpio Hermosillo:** 10 mi S of Hermosillo, rocky cerro slope, 6 Sep 1939, *Gentry 4554!* **Mpio Ímuris:** Magdalena Canyon, 11 mi NE of Ímuris, 10 Sep 1934, *Shreve 6624!* **Mpio La Colorada:** 4 mi NE of Colorado, between Colorado and Mazatán, 400 m, 6 Sep 1941, *Wiggins & Rollins 315* (ARIZ!, GH!). **Mpio Moctezuma:** 21.4 km S-SE of Moctezuma on SON 117 to Tepache, 29°38'26"N, 109°34'09"W, 697 m, basalt plain with open dwarf thornscrub, flowers lavender, 9 Oct 2003, *Van Devender 2003-1226!* **Mpio Navojoa:** 1 mi SW of Mesa Masiaca (S of Navojoa), coastal thornscrub, common annual in disturbed roadbed, flowers purple, 7 Oct 1992, *Van Devender 92-1064!* **Mpio Santa Cruz:** Rancho Los Fresnos, Nature Conservancy reserve in upper San Pedro River drainage, US-Mexico border, 31.3205°N, 110.37°W, 5100 ft, grassland with isolated patches of oak-mesquite woodland, in fruit, 25 Nov 2006, *Boyle 7977!* **Mpio Villa Hidalgo:** Oputo [= Villa Hidalgo], 1150 m, 3 Nov 1890, *Hartman 196* (GH!). **Mpio Ures:** Rancho El Fluta, Sierra de Mazatán, oak woodland, 29°06'N, 110°12'50"W, 1260 m, flowers lavender, 9 Oct 2004, *Reina-G. 2004-1241!* **Mpio Yécora:** 16.7 km NE of Yécora, grassland in oak woodland, 1410 m, flowers lavender turning pink then magenta, 2 Sep 2000, *Van Devender 2000-642!*

***Ipomoea cristulata* Hallier f., Meded. Rijks Herb. Leiden 46:20. 1922.** TYPE: MEXICO: *Schumann 17* (SYNTYPE: B, not seen); *Aschenborn 364* (SYNTYPE: B, not seen); VALLE DE MEXICO, 1865, *Bourgeau 1061* (SYNTYPE: G-DC!); SAN LUIS POTOSI, 1875–79, *Schaffner* (SYNTYPE: B, not seen, M, not seen). New name for *Quamoclit gracilis* Hallier f., *Bull. Herb. Boiss.* 7:416. 1899.

*Ipomoea coccinea* of authors, not L. (1753).

*Ipomoea coccinea* var. *hederifolia* sensu Kearney & Peebles, not L. (1759).

#### STAR MORNING GLORY

Annual **herbs**, the stems twining, glabrous or pilose on the nodes. **Leaves** with blades 1.5–10 cm long, 1–7 cm wide, ovate, the lower leaves typically entire and the upper leaves 3- or 5-parted, or all palmately parted or lobed, the margins irregularly dentate, the base cordate to ± truncate, the lobes rounded to acute, apically acute to acuminate or rarely obtuse, mucronate, glabrous or pilose below; petioles 2–9 cm long. **Inflorescences** cymose or rarely solitary. **Flowers** 3–7, on peduncles 3–6(–25) cm long, the pedicels 5–14 mm long, reflexed in fruit; bracts 1–3.5 mm long, linear-lanceolate to ovate, aristate. Sepals unequal, the outer ones oblong, 3–3.5 mm long, 2–2.5 mm wide, obtuse and rounded to ± truncate apically, muricate or smooth, with a ± terminal arista 3–5 mm long, glabrous, the inner sepals oblong, 4–5.5 mm long, 3–3.5 mm wide, apically truncate, with a ± terminal arista 2.5–3.5 mm long. Corollas 1.8–2.6 cm long, salverform, red or red-orange, glabrous, the limb 1–1.5 cm wide. **Capsules** ± globose, 7–8 mm wide, with an apiculum 2 mm long. Seeds 1–4, 3.5–5 mm long, ovoid, black to dark brown, finely tomentose.  $2n = 30$ .

**Sonora.**—Through much of the state except western Sonora northwest of the Guaymas region. Sonoran and Chihuahuan deserts, coastal and foothills thornscrub, tropical deciduous forest, grasslands, oak woodland, and pine-oak forest; 35–2000 m. Flowering April–November.

**General distribution.**—Arizona, New Mexico, Texas; Baja California Sur, Chihuahua, Coahuila, Nuevo León, Tamaulipas south to Edo. México and Distrito Federal.

This and the related *I. hederifolia* are commonly visited by butterflies and hummingbirds. The small, red-flowered ipomoeas, making up the *I. cristulata* complex, are widespread in warm regions of the Americas and often distinguished by subtle traits. Sepals are unequal and the inner ones 4–5.5 mm long in *I. cristulata*, distinguishing it from *I. hederifolia* with ± equal sepals, the inner ones being 1.3–5 mm long. Also, fruits are typically recurved on their pedicels in *I. cristulata* and always erect in *I. hederifolia*.

McDonald (pers. comm., June 2012) has correctly pointed out that these plants, except for the lobing of the leaves, are indistinguishable from *I. cholulensis*. He considers *I. cristulata* nothing more than desert forms of a more widespread *I. cholulensis*. For the moment we maintain them as separate species but point out the similarities so that future students can evaluate the relationships.

**Mpio Agua Prieta:** Hill NE of Sierra Anibácachi, Rancho La Calera, ca. 10 km (by air) SW of Agua Prieta, 31°13'59"N, 109°37'53"W, 1287 m, annual vine, flowers red, 2 Oct 2004, *Van Devender 2004-1113!* **Mpio Álamos:** San Bernardo, 24 Aug 1935, *Gentry 1627!* **Mpio Fronteras:** 2.6

mi S of Esqueda, 22 Jul 1960, *Felger 4045!* **Mpio Guaymas:** Cañón Nacapule, 18 Nov 1985, *Felger 85-1310!* **Mpio Hermosillo:** Cañón Las Chivas, Sierra Libre, al Sur de la ciudad de Hermosillo, por la Carr. Fed. 15, 28.583°N, 110.96528°W, 8 Oct 1997, *Búrquez 97-501* (USON!). **Mpio Huatabampo:** 7 km NW Ejido Nacapul in Arroyo Jeberojaquia, 1.2 km NE of Melchor Ocampo, 20 Oct 1994, *Friedman 443-94!* **Mpio Ímuris:** 17.1 km NE of Ímuris on MEX 2, 30.87470°N, 110.7310°W, 9 Sep 2002, *Doan 1203* (ASU! mixed collection, *I. cristulata* and *I. barbatisepala*). **Mpio Magdalena de Kino:** 11 mi S of Ímuris, upper edge of desert, 4 Sep 1980, *Felger 80-12.* **Mpio Nacozari de García:** 2 mi E of rd junction 13 mi S of Curicachi, among *Quercus emoryi*, 4550 ft, 7 Sep 1961, *Mason 2072!* **Mpio Nogales:** Camino Nogales–Santa Cruz, 31°19'04"N, 110°43'37"W, 1257 m, bosque encino, 15 Aug 2001, *Sánchez-Escalante N-059!* **Mpio Santa Cruz:** Rancho Los Fresnos, Nature Conservancy reserve along US-Mexico border, 31.3205°N, 110.37°W, 1555 m, grassland with sparse mesquite and oak, corolla bright red, 21 Sep 2006, *Boyle 7840!* **Mpio Yécora:** Near Los Vallecitos, 14.7 km E of Yécora on MEX 16, pine-oak forest, 28°22'38"N, 108°50'03"W, 1470 m, 10 Sep 1996, *Van Devender 96-521!*

***Ipomoea decasperma*** Hallier f., Bull. Herb. Boissier 5:386, t. 14, 1897. TYPE: MEXICO. [Estado de México]: Montagne de Zacoalco, près Guadalupe, Vallée de Mexico, 28 Août. 1865, *Bourgeau 797* (LECTOTYPE designated here: G [G00342886]!; ISOLECTOTYPE: G [G00342885]!, P [P00622222, P00622223, P00622224!]). SYNTYPES: Dans les buissons du mt. Zacoalco près Guadalupe, Vallée de Mexico, 10 Jul 1865, *Bourgeau 497* (G [G00342883]!, P [P00622225, P00622226!]); Vallée de Mexico, Pédrégal, 15 Sep 1865, *Bourgeau 792* (G [G00342884]!, P [P00622227, P00622228, P00622229!]); *Schmitz 108* (W, not seen). The specimen selected as lectotype (G00342886) is the most complete of the sheets cited; it also has the root in longitudinal section and fruits of the illustration (t. 14) on p. 1301 of Hallier's publication.

*Ipomoea oreophila* House, Ann. New York Acad. Sci. 18:195. 1908. TYPE: MEXICO. HIDALGO: rocky hills, Lens Station, 8300 ft, 24 Aug 1905. *Pringle 10034* (HOLOTYPE: GH!, ISOTYPES: F!, NY!, US!).

**Perennials** from a large, thickened root, the stems 1–1.5 m long, twining, finely white-pubescent, becoming glabrous with age. **Leaves** 3–5 cm long, 3–4 cm wide, entire or trilobate, or almost 5-lobed, white-pilose, somewhat sagittate to cordate, the apex acute, mucronulate; petioles 2–3.5 cm long, white-pilose. **Inflorescences** with axillary peduncles 3–20 cm long, white-pilose. **Flowers** solitary on slender pedicels 8–10 mm long, pilose; bracts 2–4 mm long, linear, pilose. Sepals 10–15 mm long, 7–8 mm wide at the base, herbaceous, more or less equal, pubescent, triangular-ovate, acute (not attenuate), white-pilose. Corollas blue to bluish, 5 cm long, 4–5 cm wide, the tube white. **Capsules** about as long as the calyx, glabrous, 5-valved, 5-locular, often 10-seeded, the 5 valves often bifid; pericarp chartaceo-ligneus, brownish. Seeds 1–potentially 10, 4 mm long, discoid, black, with short erect trichomes.

**Sonora.**—East-central part of the state in pine-oak forest, 1300 m. Flowering August–September.

**General distribution.**—Hidalgo, Michoacán, Edo. Mexico, Sinaloa, Zacatecas; reported from Chiapas (*Nelson 3149*, NY and GH, neither seen).

This perennial species is similar to and might be confused with annual *I. purpurea*. The sepals of *I. decasperma* lack the setose trichomes of *I. purpurea*; leaves of *I. purpurea*, while variable, are not sagittate as in *I. decasperma*.

**Mpio Yécora:** Tributary of Arroyo de Pilares near bridge, 24.7 km W of Maycoba on MEX 16, 1300 m, oak woodland with scattered pines in shady, narrow, steep canyon, rare annual or perennial on shady slope, flowers open 10:00–11:00 a.m., blue with lavender throat, drying magenta, 2 Sep 2000, *Reina-G. 2000-622, 2000-627* (USON!).

***Ipomoea hederacea*** Jacq., Collect. Bot. 1:124, pl. 36, 1787 [title page 1786]. TYPE: "AMERICAS" (actually cultivated in the botanical garden in Vienna), *Jacquin s.n.* (W!). Lectotypification by Austin, *Taxon* 35:356. 1986 was in error (ineffective, according to the Code) since Jacquin did not mention the Dillenius plate.

*Ipomoea desertorum* House, Ann. New York Acad. Sci. 18:203. 1906. TYPE: U.S.A. ARIZONA: *Thurber 29* (HOLOTYPE: NY!, ISOTYPE: US!).

*Ipomoea hederacea* var. *integriuscula* A. Gray, Syn. Fl. N. Amer. ed. 2, 2:433. 1886. TYPE: U.S.A. East Florida, *Curtiss* (HOLOTYPE: GH!).

*Ipomoea hirsutula* pro parte.

TROMPILLO, TROMPILLO AZUL, TROMPILLO MORADO; IVY-LEAF MORNING-GLORY; HEHE QUIIJAM 'PLANT THAT-CURLS-AROUND-IT,' HATAAIJ 'WHAT IS SPUN (like a top)' (Seri)

Annual **herbs**, the stems twining, often 2–3+ m long, densely to sparsely pubescent throughout. **Leaves** with blades ovate to ± orbicular, (2–) 3.5–13 cm long and about as wide, entire to 3- or 5-lobed, basally cordate, the lobes apically acute to acuminate, pubescent; petioles to 12 cm long, rarely longer. **Inflorescences** cymose. **Flowers** 1–3(–6), on peduncles 5–10 cm long, the pedicels 3–7 mm long, erect in fruit; bracts foliaceous, elliptic to lanceolate, 5–8 mm long. Sepals ± equal, 12–25 mm long, 4–5 mm wide, herbaceous, lanceolate, abrupt-

ly narrowed from the ovate base into a narrow linear-lanceolate apex, usually curved, at least in fruit, the apex sometimes strongly curved, densely long-hirsute at least on the basal  $\frac{1}{3}$ . Corollas funnellform, 2–3.7(–4.5) cm long, light blue or pinkish to lavender, with the inside of the tube white or pale yellow, the limb 1.7–3.5 mm wide. **Capsules**  $\pm$  globose, somewhat depressed, 8–12 mm wide, enclosed within the sepals. Seeds 1–4, pyriform, dark brown to black, densely hairy with short trichomes, 4–4.8 mm long.  $2n = 30$ .

**Sonora.**—Nearly statewide, this is the most widespread convolv species in Sonora, where it is a common summer-rainfall annual, often along washes, canyons, and playas, but also open areas, in natural and disturbed areas including roadside habitats and cultivated ground. Sonoran desert, grassland, and tropical deciduous forest. In desert regions and elsewhere it is often seasonally common in densely vegetated, brushy arroyo bottoms and playa margins; near sea level–1900 m. Flowering August–November.

**General distribution.**—Arizona, New Mexico, Texas, southeastern United States; Baja California Sur, Chihuahua, Nuevo León, Tamaulipas, south to Guerrero, Oaxaca, Chiapas; South America. Widespread in the Americas; adventive in the Old World. (See discussion under *I. nil*).

Leaf shape in this species, and perhaps in many others, is under simple genetic control and is useless for recognition of varieties (Elmore 1986). While Elmore's paper that leaf variability is a simple genetic trait is the only publication typically known in English-speaking countries, that shape control has long been known in Japan where studies of the genetics of this and the related *I. nil* began to be published in the 1800s.

**Mpio Agua Prieta:** 5 mi S of Agua Prieta, flowers closed in day, 7 Sep 1960, *Felger 3972!*; Colonia Morelos, fls blue, *trompillo*, 2600 ft, 15 Sep–4 Oct 1941, *White 4425!* **Mpio Álamos:** 14 km SE of Álamos, 350 m, flowers purple, 12 Oct 1992, *Van Devender 92-1294!*; Arroyo Menditero at crossing of Álamos–El Chinal road & rio Cuchujaqui, 12 km (airline) S of Álamos, near 26°54'48"N, 108°55'W, 2450 m, tropical deciduous forest on slopes, 5 Oct 1992, *Sanders 12561 (UCR!)*. **Mpio Benjamín Hill:** Rancho el Peñascoso, 1.9 km W of Benjamín Hill, 30.1603°N, 111.1508°W, 704 m, flowers purple, 17 Oct 2003, *Reina-G. 2003-1186!* **Mpio Carbó:** 12.3 mi by Tecolote road (1.2 mi N of El Oasis) W of MEX 15, 725 m, 24 Aug 1982, *Reichenbacher 1064 (ASU! mixed collection, upper buds are *I. hederacea*, the full flower at bottom is *I. nil*)*. **Mpio Cucurpe:** 8.7 mi NE of Cucurpe, oak grassland, 3800 ft, *Toolin 3 Oct 1979!* **Mpio Guaymas:** 1 km N of Bahía San Carlos on old rd from San Carlos to Bahía Algodones, 21 Oct 1984, *Felger 84-195!* **Mpio Villa Pesqueira:** 15 mi NE of Mátape on road to Batuc, corolla bright blue, 10 Sep 1941, *Wiggins & Rollins 453!* **Mpio Puerto Peñasco:** 6 km W of Los Vidrios, corollas blue, annual vines climbing in mesquite shrubs, 25 Oct 1992, *Felger 92-965!* **SONORAN ISLANDS:** Tiburón, E side, vicinity of Zozni Quimpla, 28.98596°N, 112.21394°W, 23 Nov 2006, *Wilder 06-349!* (see *Felger & Wilder 2012* for additional records).

***Ipomoea hederifolia* L.**, *Syst. Nat.*, ed. 10, 925. 1759. TYPE: based on *Quamoclit hederiae folio trifido*, Plumier in *Burm.*, *Pl. Amer.*, fasc. 4:82, t. 93, f. 2, 1756 (LECTOTYPE!). *Quamoclit hederifolia* (L.) G. Don, *Gen. Hist.* 4:259. 1838. *Quamoclit coccinea* var. *hederifolia* (L.) House, *Bull. Torrey Bot. Club* 36:599. 1909.

*Ipomoea coccinea* of authors, not L. (1753). *Quamoclit coccinea* of authors, not (L.) Moench.

**Herbs**, annual, the stems twining, herbaceous, to 4 m long, glabrous. **Leaves** ovate to  $\pm$  orbicular, 2–15 cm long, (3) 5- or 7-lobed, glabrous or puberulent. **Inflorescences** with dichasial primary branches, followed by monochasial branches. **Flowers** 5–18. Sepals glabrous, 1.3–5 mm long,  $\pm$  equal, oblong to elliptic, obtuse or truncate, the two outer ones with a  $\pm$  terminal arista 1.6–6 mm long. Corollas 1.4–3 cm long, salverform, red to red-orange, glabrous. **Capsules** 6–8 mm long,  $\pm$  globose, brown, glabrous. Seeds 1–4, 4–5 mm long, pyriform, tan or black, with inconspicuously pilose rows of trichomes along the sides.  $2n = 28, 30$ .

**Sonora.**—Widely scattered in coastal and foothill thorscrub, tropical deciduous forest, oak woodland, and pine-oak forest, in natural and disturbed habitats, and one historic record at the desert edge (at Guaymas); near sea level–1800 m. Mostly flowering September and October.

**General distribution.**—Texas eastward in USA; Baja California Sur, Chihuahua, Coahuila, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Puebla, Queretaro, San Luis Potosí, Sinaloa, Tamaulipas, Yucatan; Mesoamerica; Argentina, Bolivia, Brazil, Colombia, Guyanas, Ecuador, Peru, Venezuela; Caribbean. Naturalized in Africa, Asia, and Australia.

Plants in Arizona are typically misidentified as this species, but are actually *I. cristulata*. No specimens of *I. hederifolia* from Arizona have been found. Sepal size is the best way to distinguish the two: in *I. hederifolia* both outer and inner sepals are 1.3–5 mm long, *I. cristulata* has outer sepals 3.5 mm long and inner sepals 4–5.5 mm long.

**Mpio Álamos:** Arroyo Mentidero, at crossing of Álamos–El Chinal road, Río Cuchujaqui, 26.9133°N, 108.917°W, 240 m, tropical deciduous forest, scarce annual vine with red flowers, 6 Oct 1992, *Sanders 12669* (UCR!). **Mpio Guaymas:** Guaymas, 1887, *Palmer 310* (US, cited by O'Donnell 1959b: 51, not seen). **Mpio Ímuris:** Rancho La Pantera, ca. 20 km NE of Ímuris on MEX 2, 30.8853°N, 110.709°W, 1120 m, uncommon vine, flowers salmon, open at 12:30 p.m., sycamore stand in rocky canyon in oak woodland, 15 Sep 2000, *Van Devender 2000-690!* **Mpio Navojoa:** Summit of Cerro Prieto, vicinity of microwave station, 15 km E of Navojoa above road to Álamos, 27.25°N, 109.283°W, 400 m, thorn forest, scarce 1.5 m high vine on shrubs beside the road, flowers red, 5 Sep 1989, *Sanders 9307* (UCR!). **Mpio Ónavas:** Ónavas, bosque, 200 m, Pima Bajo = *vipsumar*, 12 Oct 1986, *Rea 1232!* **Mpio San Pedro de la Cueva:** Between Tepupa and Batuc, 28 Sep 1934, *Wiggins 7499* (CAS!); N of Mazatán, between Mátape and Mazatán, 1680 ft, 11 Sep 1941, *Wiggins & Rollins 470* (CAS! MO!).

***Ipomoea heptaphylla*** Sweet, Hort. Brit. 372. 1830. TYPE: INDIA: WEST BENGAL: grown in Botanical Garden at Calcutta, *Roxburgh plate 1950* (LECTOTYPE designated by Verdcourt 1961: 11). Manitz (1983: 179) pointed out that Sweet created a new name and not a new combination, thus making it the earliest for this species. We have reviewed the information Manitz gives, examined the lectotype (Roxburgh 1824), and concur with his conclusions. *Convolvulus heptaphyllus* Roxb., Fl. Ind. (ed. Carey and Wallich) 2:66. 1824, not *C. heptaphyllus* Rottler in Willd. (1803). *Ipomoea heptaphylla* (Roxb.) Voigt, Hort. Suburb. Calcutt. 360. 1845.

*Ipomoea wrightii* A. Gray, Syn. Fl. N. Amer. 2:213, 1878. TYPE: U.S.A. TEXAS: *Wright* (HOLOTYPE: GH!).

*Ipomoea spirale* House, Muhlenbergia 3:40. 1907. TYPE: MEXICO. SONORA: Jaquí [Yaqui] river, 1864, *Palmer 24* (HOLOTYPE: US!).

*Ipomoea pulchella* of authors, not Roth (1821).

**Herbs**, annual, the stems twining or prostrate, 2–8 m long, glabrous. **Leaves** petiolate, 1–4 cm long and wide, 5-foliolate, the lobules lanceolate to linear-lanceolate, sessile, apically acute, glabrous. **Inflorescences** axillary and terminal. **Flowers** usually solitary, with filiform peduncles as long as or longer than the petioles, often spirally twirled. Sepals ± equal, 5–7 mm long, ovate to oval, apically obtuse to rounded, glabrous. Corollas 1.8–3 cm long, funnellform, glabrous, rosy (or sometimes white) with the interior of the tube red-violet. **Capsules** 8–10 mm long, globose, brown, glabrous. Seeds 1–4, 4–6 mm long, ovoid, brown, finely pubescent.

**Sonora.**—Coastal thornscrub of the coastal plain in southwest part of the state, apparently not common. Margins of temporarily flooded or swampy places including roadside; below ca. 50 m. Flowering September–October.

**General distribution.**—Texas, SE USA; Mesoamerica; Argentina, Brasil, Ecuador, Paraguay, Peru; pantropical.

Although no one knows where this species is native, it shares no obvious relatives in the New World. It may well be an Old World species and perhaps is related to *I. cairica*, which is probably native to Africa. *Ipomoea heptaphylla* has been confused at least with *I. cairica* and is morphologically more similar to that species and others like it in Africa than those elsewhere. Roxburgh (1824) pointed out that the plant appeared unexpectedly in the nursery at the botanical garden in Calcutta, but he did not think it native, at least in his region.

Verdcourt (1961: 11) thought that the plant climbed with the spiraled peduncles. Although Austin has seen this plant few times, no note was made of the peduncles behaving like tendrils. Perhaps someone examining living plants in the field will be able to clarify the role of the spiraled structures.

**Mpio Bâcum:** 1.7 mi on Mex. Hwy 15 SE of junction of road to Pitahaya (= Belem on Río Yaqui), 27°45'N, 108°24'W, 10 m, coastal plain of thornscrub surrounding an apparently perennial pond densely shaded by *Prosopis glandulosa*, rare, climbing in mesquite tree at edge of pond, 11 Oct 1985, *Felger 85-1264!* **Mpio Navojoa:** Navojoa, water edge of river back-water, limb and tube white, throat purple, 27 Oct 1939, *Gentry 4746!*

***Ipomoea imperati*** (Vahl) Griseb., Cat. Pl. Cub. 203. 1866. TYPE: Imperato, Hist. Nat. 671, unnumbered illustration as “*Convolvulus marino*” (1672) (LECTOTYPE!). *Convolvulus imperati* Vahl, Symb. Bot. 1:17–18. 1790.

*Convolvulus littoralis* L., Syst. Nat., ed. 10, 924. 1763. TYPE: based on *Convolvulus foliis obtusis*, Plumier, Pl. Amer. 79, t. 90, f. 2, 1756 (LECTOTYPE!), not Blume (1826), or Boissier (1879).

*Ipomoea stolonifera* (Cyrillo) J.F. Gmel., Syst. Veg. 345. 1796. *Convolvulus stoloniferus* Cyrillo, Pl. Rar. Neap. 1:14, t. 5, 1788. TYPE: based on the plate (LECTOTYPE!).

**Herbs**, perennial, the stems prostrate, rooting at the nodes and often underground, reaching 5 m or more in length. **Leaves** 1.5–8 cm long, sometimes linear to ovate or oblong, lobed or not lobed, the size and shape variable. **Inflorescences** axillary, monochasial. **Flowers** solitary, rarely 2 or 3; opening early in the morning. Sepals 1–1.5 cm long, unequal, oblong, the outer two sepals shorter, acute to obtuse, glabrous. Corollas 2.5–5 cm

long, funnellform, white with a yellow throat, sometimes purplish within the base, glabrous. **Capsules** 1–1.5 cm long, rotund, straw-colored when mature. Seeds 1–4, 8–10 mm long, rotund, clear-brown, tomentose along the margins.  $2n = 30$ .

*Sonora*.—Coastal thornscrub on beaches and dunes in the southwestern corner of the state, near sea level.

*General distribution*.—Texas, Florida; Baja California Sur, Campeche, Guerrero, Jalisco, Nayarit, Quintana Roo, San Luis Potosí, Sinaloa, Tabasco, Tamaulipas, Veracruz; Mesoamerica; Brazil, Colombia, Guyanas, Bolivia, Ecuador, Venezuela; Caribbean; pantropical. This beach species is more common in the Atlantic region than the Pacific. Flowering all the year.

**Mpio Huatabampo**: 0.6 km E of Camahuira on beach, common sand-stabilizing rhizomatous perennial herb, flowers white, 8 May 1996, Friedman 37-96!; Camahuira, 26.5167°N, 109.267°W, on beach sand; flowers white, 8 Oct 1992, Van Devender 92-1067!

***Ipomoea laeta*** A. Gray, Proc. Amer. Acad. 22:439. 1887. TYPE: MEXICO. JALISCO: Río Blanco, Jun–Oct 1886, Palmer 341 (HOLOTYPE: GH!, ISOTYPES: K!, MO!, US!, NY!, PH!).

Perennial **herbs** from a large, oblong root; stems twining, densely white tomentose-pilose with appressed trichomes. **Leaves** with blades 3–7 cm long and wide, suborbicular in outline, deeply 3- or 5-lobed, basally cordate, lobes apically acute to acuminate, pubescent like stems; petioles 1–6 cm long, pubescent like stems. **Inflorescences** 1-flowered. **Flowers** on peduncles about as long as the petioles, pedicels 0.5–1 cm long; bracts 0.5–1 cm long, linear-lanceolate to lanceolate. Sepals more or less equal or the outer two slightly shorter and triangular-ovate, 14–16 mm long, 6–8 mm wide, truncate to rounded at the broad base, apically acute to acuminate, hirsute. Corollas 8–12 cm long and wide, funnellform, blue to pink-purple, pubescent on the outer surface. **Capsules** 12–14 mm long, ovoid, glabrous, surrounded by the sepals. Seeds not seen.

*Sonora*.—Pine-oak forest in mountains of the upper Río Mayo region along the Chihuahua border close to southeastern Sonora, and expected in immediately adjacent Sonora.

*General distribution*.—Chihuahua, Hidalgo, Jalisco, Nayarit, Queretaro.

The species is similar to *I. pubescens* and *I. decasperma* but is easily separated from them, when in flower, by the pubescent and notably large corollas.

**CHIHUAHUA. Mpio Chinipas**: Arroyo Hondo, Sierra Charuco, flower blue with purple ribs ["ribs" = interplicae], 11 Sep 1935, Gentry 1788!

\****Ipomoea* × *leucantha*** Jacq., Icones Pl. Rar. 2:10, t. 318, 1788. TYPE: Jacquin, Icon. Rar. 2. t. 318 (LECTOTYPE!). *Convolvulus dentatus* Blanco, Fl. Filip. 89. 1837; ed. 2, 66. 1845, not Vahl (1794); ed. 3, 1:123, t. 31 (as *I. commutata* Roem. & Schult.). TYPE: plate t. 31 (LECTOTYPE!).

*Ipomoea blancoi* Choisy in DC., Prodr. 9:389. 1845. Based on *Convolvulus dentatus* Blanco.

*Ipomoea triloba* of authors, not L.

Annual **herbs**, the stems twining or procumbent, glabrous to sparsely hairy. **Leaves** with blades 2–8 cm long, 2–7 cm wide, broadly ovate to orbicular, entire, dentate to 3 or 5 lobed, basally cordate, the apex acute to obtuse; petioles 2–3 cm long. **Inflorescences** axillary, mostly sub-umbellate cymose, less often 1-flowered. **Flowers** on pedicels (4–) 10–30 mm long, erect in fruit; bracts scale-like. Sepals ± equal, (8–)10–14 mm long lanceolate-acuminate, mucronate, glabrous. Corollas funnellform, 0.6–1.5(–2) cm long, white to lavender or pink, the throat often darker, the limb mostly less than 1 cm wide. **Capsules** ± globose, 7–8 mm wide, bristly hirsute. Seeds 1–4, 3.2–4 mm long, ovoid, black to dark brown, glabrous.

*Sonora*.—Widespread across the state, but apparently not at higher elevations. Disturbed sites, often a weed in cultivated fields and gardens, and coastal and foothills thornscrub and tropical deciduous forest; 20–850 m. Flowering at least August–October.

*General distribution*.—Arizona, New Mexico, Texas; scattered sites in Mexico, including Sonora to Veracruz; Central America; Caribbean; South America.

Widespread weed in disturbed habitats from southern United States, including Arizona, to Argentina and Peru. This plant is a stable hybrid between *I. cordatotriloba* Dennst. (*I. trichocarpa* Elliott) and *I. lacunosa* L. (Abel and Austin 1981; Austin 1978). *I. lacunosa* is usually totally autogamous (selfing) whereas *I. cordatotri-*



*loba*, with larger flowers, is usually allogamous (outcrossing; McDonald et al. 2011). The honeybee, introduced from the Old World, carries pollen from one species to the other and is the only insect known to move between the two. However, certain other pollinators, when present, will visit *I. lacunosa* and the hybrid. Presumably the hybrid is moved, as it has been around the world, as a contaminant in seeds of cultivated plants.

**Mpio Álamos:** Near Álamos, abandoned milpa, lavender flowers, 1200 ft, 28 Oct 1939, *Gentry 4767!*; Rancho San Pedro, E entry to El Cajón along Rio Cuchujaqui, 500 m, 10 Nov 1988, *Martin & Jenkins 88-26!*; Álamos, in streambed, 390 m, flowers pink, 2 Feb 1992, *Van Devender 92-154!*; Canyon Estrella, 1 Oct 1933, *Gentry 426Ma!* **Mpio Benjamín Hill:** 24 km S of Rancho El Seri, 8.2 km S of Rancho El Carrizo (16.9 km W of MEX 15 at 20.5 km S of Benjamín Hill), mesquite bosque, 29°58'58"N, 111°15'24"W, 755 m, 22 Aug 2007, *Van Devender 2007-890!* **Mpio Guaymas:** Near Mori, Yaqui country, marginal to water standway on heavily brushed coastal plain, 26 Oct 1939, *Gentry 4743!* **Mpio Huatabampo:** 6.8 km S of Camahuiroa, 10 m elev, flowers purple, 20 Oct 1994, *Friedman 438-94!* **Mpio Navojoa:** Navojoa, water edge of river back-water, 27 Oct 1939, *Gentry 4747!* **Mpio Ónavas:** Ónavas, near fields, fls pale rose pink in center to pale magenta at edges, 11 Oct 1986, *Rea 1210!* **Mpio San Luis R.C.:** 5 km S of San Luis, roadside and irrigation ditches in agricultural fields, corolla pinkish, open in early morning, 6 Oct 1985, *Felger 85-1032!* **Mpio Yécora:** Santa Ana 2 km E-NE of town just beyond Bermudez Junction, major trail to milpas, 28°22'40" N, 109°08' W, 950 m, *Ott, Martin, et al. 10 Oct 1988.*

***Ipomoea longifolia* Benth., Pl. Hartw. 16. 1839.** TYPE: MEXICO. ZACATECAS: *Hartweg 97* (HOLOTYPE: K!; ISOTYPES: NY!, P!); other sheets with species #97 (species numbers?) are from Chihuahua (K!) and Leon (BR!, LD!).

Large perennial **herbs** forming large tuberous roots, somewhat fleshy, rhizomatous, glabrous, the stems long, trailing, decumbent, or ascending. **Leaves** with blades linear to oblong-lanceolate, often 10–12(–20) cm long, 2–4 cm wide, entire, glabrous; petiole 0.5–1.7 cm long. **Inflorescences** mostly solitary. **Flowers** on peduncles 3.5–4(–11) cm long, the pedicels 2–3.5 cm long, mostly erect in fruit. Sepals ovate, the outer ones 12–14(–17) mm long, 6–7 mm wide, the inner ones 15–20 mm long, 7–8 mm wide, coriaceous, glabrous. Corollas funnel-form, 7–10 cm long, the limb whitish to cream-white, 7–8 cm wide, the throat purple or deep reddish purple. **Capsules** ovoid, 14–16 mm wide, with an apiculum 2–3 mm long. Seeds 1–3(4), 10–11 mm long, ovoid, brown, with long pilose indumentum on the margins and near the apex.

**Sonora.**—North-central and northeast part of the state in grassland, oak woodland, foothills thornscrub, and tropical deciduous forest; 975–1850 m. Flowering April–September.

**General distribution.**—Southeastern Arizona and northern Mexico in Aguascalientes, Chihuahua, Durango, Guanajuato, Jalisco, Queretaro, San Luis Potosí, Zacatecas.

The flowers are open in the evening and are pollinated by moths, although there have been reports of bees also visiting (Austin 1986).

**Mpio Bacanora:** 21 km W of Bacanora on road to La Estrella, S slope of Sierra Batamote, ca. 1100 m, 2 Oct 1990, *Reina-G. 99-870!* **Mpio Cananea:** Sierra de los Ajos, 20 mi N of Bacoachi, 1625 m, white corolla with deep red-violet throat, 25 Jul 1993, *Fishbein 1259!* **Mpio Cucurpe:** 1 mi W of Rancho Agua Fria on road to Cucurpe, desert grassland, flowers white with purple throat, 18 Aug 1991, *Van Devender 91-677!*; 8.7 mi ENE of Cucurpe, 3800 ft, *Toolin 4 Oct 1979.* **Mpio Ímuris:** 17.1 km NE of Ímuris on MEX 2, 30.8747°N, 110.731°W, 4313 ft, oak woodland, 9 Sep 2002, *Doan 1207 (ASU!)*; 5 km W-SW of Cuitaca, 48 km NE of Ímuris on Mex 2, oak woodland, 1210 m, 15 Sep 2000, *Van Devender 2000-684!* **Mpio Nacozari de García:** 5 km N of Nacozari, oak grassland, 24 Jul 1960, *Felger 3653!*; 2 mi E of Mex Hwy 12 on road to La Angustura, oak grassland, *Baker 17 Aug 1984!* **Mpio San Felipe de Jesús:** Vicinity El Llano, 9.5 mi W of San Felipe, Sierra de los Locos, *Hole & Martin 11-12 Aug 1980!* **Mpio San Pedro de la Cueva:** Sierra Batuc, 8 mi NE of Mátape, corollas white faintly tinged with purple on the limb, deep purple in the throat, 9 Sep 1941, *Wiggins & Rollins 414!* **Mpio Santa Cruz:** 20 km E of Nogales on road to Santa Cruz, S extension of Patagonia Mountains, oak woodland, 31.3172°N, 110.721°W, very common prostrate perennial vine, flowers white, purple-pink inside tube, stamens and pollen white, open late afternoon to early morning, 17 Jul 2001, *Reina-G. 2001-535!*

***Ipomoea madreensis* S. Watson, Proc. Amer. Acad. Arts 23:281. 1888.** TYPE: MEXICO. CHIHUAHUA: Pine plains, base of the Sierra Madre, Sep 1887, *Pringle 1338* (HOLOTYPE: GH!, ISOTYPES: F!, K!, MO!, NY!, RSA!, US!).

Perennial **herbs**, roots tuberous, the stems erect, scandent, or less often twining, 4–50 cm long, mostly branched from the base, glabrous. **Leaves** variable, the first ones usually elliptic, rhombic, or narrowly lanceolate, 1.5–5 cm long, 3–20 mm wide, occasionally lobed, the lobes to 6 mm long, 5 mm wide, margins entire or irregularly dentate, apex acute, mucronulate, the base attenuate, the distal leaves sometimes grading into palmatisect laminae with 3–5 segments, about equal or unequal, filiform, linear, or lanceolate, 7–42 mm long, 1–6 mm wide, the outer segments often shorter than the inner ones, margins entire, apex obtuse or acute, the base attenuate, glabrous; petioles almost absent or 2–10 mm long. **Inflorescences** monochasial axillary cymes.

**Flowers** 1 or 2 on peduncles 2–10 mm long, the pedicels 6–10 mm long, often subtended by a deciduous bracteole ca. 3 mm long and 2 mm wide. Sepals more or less equal or the outer ones slightly smaller than the inner ones, broadly elliptic, 6–8 mm long, 4–6 mm wide, coriaceous, the midrib muriculate, the margins entire, barely hyaline, the apex acute. Corollas funnellform, 3–4 cm long, the limb 2.5–3 cm wide, blue-purple, glabrous. **Capsules** depressed, almost globose, 5–6 mm wide, brown, chartaceous, glabrous. Seeds often 4, ca. 2 mm wide, rotund, dark brown, puberulent.

*Sonora*.—East-central and southeast Sonora in mountains near the Chihuahua border in oak woodland and pine-oak forest; 1240–2120 m. Flowering July–October.

*General distribution*.—Southwestern Chihuahua and southward in the Sierra Madre Occidental and altiplano of central Mexico and the Valley of Mexico; Aguascalientes, Chihuahua, Distrito Federal, Durango, Edo. México, Michoacán, Nayarit.

Although not immediately obvious, this species is likely related to *I. capillacea* and *I. plummerae*.

**Mpio Álamos**: Rancho El Rayo, between Las Chinacas and La Lobera, 1500 m, *Martin* 18 Aug 1991!; 3.6 km below (SW) Rancho Santa Bárbara, 27.108611°N, 108.730833°W, 1240 m, oak woodland, flowers purple, 3 Oct 2006, *Van Devender* 2006-1142! **Mpio Yécora**: Mesa Grande, 28°26'30"N, 108°59'W, willow oak-Apache pine-juniper, 1800 m, *Martin* 12 Aug 1987!; Sonora-Chihuahua [border], summit of Mesa El Campanero between Yécora, Sonora and Bermúdez, Chihuahua, 28°20'N, 109°02'W, pine-oak forest, 2121 m, 1 Aug 1985, *Turner & Martin* 85-30!; Yécora, 28°22'25"N, 108°55'30"W, 1540 m, *Traub* 19 Aug 1997 (FTG-FAU!); Mesa el Campanero, 2000 m, flowers purple, 6 Sep 1996, *Van Devender* 96-397!

***Ipomoea meyeri* (Spreng.) G. Don, Gen. Hist. 4:275. 1838.** TYPE: of unknown origin. *Meyer* in herb. Willdenow (B-W!).

*Convolvulus meyeri* Spreng., Syst. Veg. 1:597. 1825 [1824].

*Ipomoea isostemma* House, Ann. New York Acad. Sci. 18:207. 1908. TYPE: COSTA RICA: Nicoya, Jan 1900, *Tonduz* 13680 (HOLOTYPE: NY!, ISOTYPE: fragment US!).

*Ipomoea chiapensis* Brandege, Univ. Calif. Publ. Bot. 6:60. 1914. TYPE: MEXICO. CHIAPAS: Tonalá, Oct 1902. *Purpus* 6907 (HOLOTYPE: UC!, ISOTYPES: BM!, F!, NY!, MO!, US!).

*Ipomoea brachypoda* Benth., Bot. Voy. Sulphur 135. 1844. TYPE: MEXICO. GUERRERO: Acapulco. *Sinclair* s.n. (lectotype K!, lower left specimen of mixed collection; lower right specimen is *I. aristolochiifolia*); Panama: Isle of Taboga, Bay of Panama. *Anonymous* s.n. (SYNTYPE: not seen); Colombia [Ecuador on label in Bentham's handwriting, but someone else has written "Not"]. 1842. *Sinclair* (SYNTYPE: K!).

*Ipomoea iodantha* Brandege, Univ. Calif. Pub. Bot. 4:383. 1913. TYPE: MEXICO. BAJA CALIFORNIA [SUR]: Cape Region, La Mesa, 31 Oct 1902, *Brandege* s.n. (HOLOTYPE: UC! barcode 105204, photo MEXU!).

**Herbs**, annual, the stems twining, herbaceous, to 3 m long, glabrous or somewhat pilose. Leaves (2–)4–10 cm long, 2–7 cm wide, ovate, entire or slightly hastate-trilobed on the basal lobes, apex acute, acuminate, glabrous. **Inflorescences** in dichasial glomerules. **Flowers** 1–3(–9); bracts foliaceous, resembling the sepals. Sepals 1–2 cm long, equal, lanceolate, acuminate, the base hirsute, the apex glabrous and attenuate, spreading to reflexed. Corollas (1–)2–3 cm long, funnellform, blue, purplish or rose, with the throat white or yellow, glabrous. **Capsules** 7–10 mm long, conical, clear brown, glabrous. Seeds 1–4, 4–8 mm long, pyriform, light to dark brown, pubescent with short trichomes.

*Sonora*.—Southeastern Sonora along riparian arroyos or canyons in tropical deciduous forest; ± 200 m. Flowering at least in September and October. (See discussion under *I. nil*).

*General distribution*.—Baja California Sur, Chiapas, Distrito Federal, Guerrero, Jalisco, Michoacán, Oaxaca, Quintana Roo, Sinaloa, Veracruz, Yucatan; Mesoamerica; Colombia, Ecuador, Peru, Venezuela; Caribbean.

Phylogenetic evidence (McDonald et al. 2011) indicates this is sister to *I. variabilis* (Schltdl. & Cham.) Choisy and distant from *I. hederacea* and *I. nil*. Sepal morphology has suggested otherwise but the 2-locular capsules agree with phylogenetic results.

**Mpio Álamos**: 6 km SE of Álamos, 30 Sep 1992, *Bertelsen* 92-134!; Güirocoba crossing of Río Cuchujaqui, 12 km SSE of Álamos, 4 Oct 1992, *Van Devender* 92-914!; El Rancheria crossing of Río Cuchujaqui, 22.5 km S of Álamos, 200 m, shady bank above river in tropical deciduous forest, flowers pink, 10 Oct 1992, *Van Devender* 92-1149!; Arroyo Menditero at crossing of Álamos–El Chinal road & down to río Cuchujaqui, 12 km (airline) S of Álamos, near 26°54'48"N, 108°55'W, 787 ft, tropical deciduous forest on slopes, 5 Oct 1992, *Sanders* 12560 (UCR!).

***Ipomoea minutiflora*** (M. Martens & Galeotti) House, *Muhlenbergia* 5:71. 1909. TYPE: MEXICO. OAXACA: dans les haies de Sola, avec le *C. tenuifolius*, à 5000 pieds. Fl. jaune-citron. Septembre. *Galeotti* 1372 (HOLOTYPE: BR!; ISOTYPES: G!, K!). *Convolvulus minutiflorus* M. Martens & Galeotti, *Bull. Acad. Roy. Sci. Bruxelles* 12:262. 1845.

*Ipomoea filipes* Benth. ex Meisn., *Fl. Bras.* 7:274. 1869. TYPE: BRAZIL. PARÁ: In vicinibus Santarém, May 1850, *Spruce* 700 (HOLOTYPE: M!; ISOTYPES: GH!, TCD!, NY!).

*Ipomoea gracillima* Peter, *Nat. Pflanzenfam.* 4(3a):30. 1891. TYPE: VENEZUELA: *Fendler* 2089 (GOET!, bar code GOET 005720). McDonald (*Fl. Veracruz* 77:77. 1994) designated the protologue lectotype, but this is ineffective as it is not based on either a specimen or an illustration (Staples et al. 2012).

**Herbs**, annual, the stems twining or prostrate, herbaceous, 1–3 m long, hispid. **Leaves** 1–4.5 cm long, 1–6.5 cm wide, ovate, entire, the apex acute, acuminate, glabrous. **Inflorescences** in monochasia. **Flowers** 1–3. Sepals 1.5–2 mm long, accrescent to 5 mm in fruit, equal, broadly elliptic to lanceolate, margins scarious, the apex acute, attenuate, hispid or pilose. Corollas 0.4–1.5 cm long, campanulate, yellow, changing to orange with age, glabrous. **Capsules** 4–5 mm long and wide, rounded, brown to straw-colored, glabrous. Seeds (1–) 4, 2–3 mm long, rounded, brown, puberulent-furfuraceous.

**Sonora.**—Mountains in central and southeast parts of the state in foothills thornscrub, tropical deciduous forest, oak woodland, and pine-oak forest (including altered soils), often in riparian canyons and in shaded forests; 240–1400 m. Flowering October to December.

**General distribution.**—Baja California Sur, Campeche, Chiapas, Chihuahua, Colima, Guerrero, Jalisco, Michoacán, Nayarit, Oaxaca, Puebla, Sinaloa, Veracruz; Mesoamerica; Brasil, Colombia, Venezuela.

This autogamous weedy species is related to *I. microsepala*, an allogamous sister species (McDonald et al. 2011).

**Mpio Álamos:** Arroyo el Mentidero at El Chinal road, 11.3 km S of Álamos, 26°54'45"N, 108°55'05"W, tropical deciduous forest, 240 m, 5 Oct 1992, *Van Devender* 92-954!; El Rincon Viejo, Arroyo El Aquaje, 3.4 km (by air) N of Álamos, Sierra de Álamos, tropical deciduous forest, 27°03'55"N, 108°56'W, 480–520 m, 23 Sep 1993, *Van Devender* 93-1073!; El Palmarito Canyon, 27°04.2'N, 108°45.3'W, 580 m, 23 Oct 1992, *Jenkins* 92-79!; Abandoned orchard of Tepopa N-NW of Chiribo, 27°19'N, 108°43.5'W, 1100–1400 m, upper tropical dry forest including riparian evergreen woods, lower edge of *Pinus oocarpa* and *Quercus pennivenia* with *Dodonaea*, *Martin* 22 Aug 1992!; Steep rocky canyon above La Aduana on Sierra de Álamos, tropical deciduous forest, flowers yellow-orange, 26 Sep 1991, *Van Devender* 91-731A!; Arroyo Mentidero, 12 km S of Álamos, 6 Oct 1992, *Sanders* 12647!; Carical [sic] road, Álamos, *Martin* 10 Oct 1990!; Sierra Saguaribo, ca. 2 km NE of La Vinateria, 1300 m, orange flowers, 24 Aug 1993, *Steinmann* 93-278!; E side of Sierra de Álamos, lower Cañón Las Piedras in the area of the tinajas, 26°59'N, 108°57.3'W, 700 m, 11 Oct 1992, *Sanders* 12860!; Pinal, Sierra Charuco, 9 Sep 1935, *Gentry* 1687! **Mpio Villa Pesqueira:** 3 mi NE of Mátape, between Mátape and Batuc, 8 Sep 1941, *Wiggins & Rollins* 395! **Mpio Yécora:** Agua Amarilla (Los Pinitos), 15 km W-NW of Tepoca, 24.7 km W-NW of San Nicolás on MEX 16, red volcanic barren rock with relict *Pinus durangensis*–*Quercus albocinta* woodland, 28°08'20"N, 109°20'23"W, ca. 900 m, flores amarillas camiendo a naranjas, 6 Sep 1995, *Reina-G.* 94-439!; 1 km E of Santa Ana on road to MEX 16, 940 m, 9 Sep 1996, *Reina-G.* 96-534!

***Ipomoea muricata*** (L.) Jacq., *Pl. Rar. Hort. Schoenb.* 3(2):40–41, t. 323, 1798, not Cav. (1799 [1794]). TYPE: INDIA. GUJARAT: habitat in Suratte, *Bradd* (LINN 218.18!). *Calonyction muricatum* (L.) G. Don. *Gen. Hist.* 4:264. 1837. *Convolvulus muricatus* L., *Syst. Nat.* ed. 12, 2:156. 1767; *Mant. Pl.* 44, 1767.

*Ipomoea turbinata* Lag., *Gen. Sp. Pl.* 10. 1816. Nom. illegit. (superfluous name for *I. muricata* (L.) Jacq.). TYPE: INDIA: Indía, Suratte, herb. Linnaeus (LINN 218.18), not *Convolvulus muricatus* Blanco (1837).

*Ipomoea calderoni* Standl., *J. Wash. Acad. Sci.* 14:242. 1924. TYPE: EL SALVADOR: at San Salvador, 1922, *Calderón* 883 (HOLOTYPE: US!).

**Herbs**, annual, herbaceous, the stems twining or prostrate, to 3–4 m long, glabrous or glabrescent, sometimes with herbaceous “spines” (aculeae) resembling trichomes. **Leaves** 7–18 (25+) cm long; blades ovate to orbicular, entire to 3- or 5-lobed, basally cordate, apically acuminate, glabrous; petioles well developed, sometimes reaching 19 cm long. **Inflorescences** axillary and terminal, cymose. **Flowers** 1–5. Sepals 6–8 mm long, glabrous, oblong to ovate, accrescent in fruit to 12–14 mm long, at least the 2 outer sepals with caudate-fleshy apices 4–6 mm long. Corollas nocturnal, sometimes opening in the late afternoon (e.g., *Van Devender* 2000-510), 3–7.5 cm long, salverform although the upper part of the tube widens near the campanulate limb, glabrous, the limb whitish when first open, becoming lavender by morning, the throat purple or pink inside. **Capsules** 1.8–2 cm long, ovoid-acuminate, with a long apiculum, brown, glabrous. Seeds 1–4, 8–10 mm long, ovoid, brown or sometimes black, glabrous.

*Sonora*.—Central and mostly southeastern part of the state in tropical deciduous forest, ca. 150–790 m. Flowering at least August–November.

*General distribution*.—Texas and Arkansas to Florida; Mexico including Baja California Sur, Chihuahua, Coahuila, Guerrero, Jalisco, Edo. México, Sinaloa; Argentina, Ecuador, Peru, Venezuela. Native to Mexico and adventive in the southern United States and South America, and also naturalized in many parts of the Old World. This species has been widely spread through the southeastern United States as a contaminant in soybean seeds (Gunn 1969a, 1972). It continues to be dispersed and established in new areas.

Confusion between names for *I. capillacea* and *I. muricata* began in the 1800s and a new layer of confusion was added by Gunn (1969a, 1969b, 1972). What these authors failed to realize, or at least point out, in addition to the nomenclatural problems, is that *I. capillacea* is a day-flowering plant and *I. muricata* is nocturnal. This was clarified by Staples et al. (2005). *Ipomoea capillacea* is a morning-flowering herb with corollas 3–4 cm long while *I. muricata* is an evening- and night-flowering vine with corollas 3–7.5 cm long. The leaves are also notably different: *I. capillacea* has nearly sessile highly dissected leaf blades with linear segments and *I. muricata* has petiolate entire to 3- or 5-lobed blades. The current residual confusion involves Gunn's conclusions so the earlier problems will not be addressed. The underlying problem is that Gunn (1969b) used the wrong date for the names involved, rejecting *I. muricata* (L.) Jacq. (1798) and using *I. turbinata* Lag. (1816). Staples et al. (2005) provide details on Gunn's error and the proper interpretation, including the complexities of the name changes between *I. muricata* and *I. turbinata*.

*Selected references*.—Austin and Jansson (1988), Gunn (1969a & b, 1972), Staples et al. (2005).

**Mpio Álamos:** Güirocoba crossing of Río Cuchujaqui, flowers white with purple centers, 4 Oct 1992, *Van Devender 92-904!*; San Bernardo, annual vine forming dense green growth over low bushes and seeding heavily, peduncles thick and fleshy, seeds large, brown, 13 Oct 1961, *Gentry 19267!*; Sejaqui by Río Mayo above San Bernardo, sandy bottomland, 1000–1500 ft, vine with blue flowers climbing over shrubs, seeds abundantly, Nov 1958, *Gentry 17651!*; Arroyo el Mentidero at El Chinal road, 11.3 km S of Álamos, 26°54'45"N, 108°55'05"W, 240 m, 5 Oct 1992, *Van Devender 92-997!*; Arroyo el Mentidero at El Chinal road, 11.3 km S of Álamos, 26°54'45"N, 108°55'05"W, 240 m, flowers lavender inside with purple throat, opening early evening, 6 Oct 1992, *Van Devender 92-1030!*; 1 km S of Yocogigua, 109°01'55"W, 160 m, 24 Sep 1993, *Van Devender 93-1082* (FTG-FAU!). **Mpio Ónavas:** Rancho La Mula, 28 km SE of Río Yaqui on Mex 16, 28°28'50"N, 109°22'W, 790 m, tropical deciduous forest, locally common perennial vine, flowers lavender with purple center, whitish outside, opening 5:30–6:00 p.m., 30 Aug 2000, *Van Devender 2000-510!* **Mpio Navojoa:** Summit of Cerro Prieto vicinity of microwave station, 15 km E of Navojoa above road to Álamos, near 27°05'N, 109°17'20"W, 1300 ft, thorn forest with *Acacia*, *Bursera*, etc, vine growing over shrubs, flowers white fading to pink, 5 Sep 1989, *Sanders 9262* (UCR!). **Mpio San Javier:** Cerro Verde, San Javier, 28°34'N, 109°43'50"W, short-tree forest, *Martin 8 Oct 1988!* **Mpio Sahuaripa:** Arroyo Los Tarais, cañón Gordehuachi, 26.3 km N of Sahuaripa on road to Moctezuma, 29.2764°N, 109.3406°W, 487 m, 14 Sep 2006, *Reina-G. 2006-831!* **Mpio Soyopa:** Arroyo Los Garambullos, 1.5 km E of Tónichi, 28°34'10"N, 109°33'00"W, 180 m, abundant vine along river bank, flowers white, tube pink inside, drying pink, open before sunrise, petals falling off easily, 29 Sep 2000, *Van Devender 2000-747!*

***Ipomoea nil* (L.) Roth, Catal. Bot. 1:36. 1797.** TYPE: Dillenius, Hort. Eltham. 1:96. t. 80, f. 91, 1732 (LECTOTYPE!). *Pharbitis nil* (L.) Choisy, Mem. Soc. Phys. Genève 439. 1833. *Convolvulus nil* L., Sp. Pl. ed. 2, 219. 1762.

*Ipomoea hederacea* of authors, not Jacq. (1786).

**Herbs**, annual, herbaceous, the stems twining or prostrate, to 3–4 m long, hispid, the trichomes yellow. **Leaves** ovate to ± orbicular, 5–15 cm long, 2–14 cm wide, entire to 3- or 5-lobed, the apices acuminate, hirsute. **Inflorescences** cymose, dichasial. **Flowers** 1–4. Sepals 1.5–2.5(–3) cm long, ± equal, linear-lanceolate, basally narrowly ovate, the base densely hispid with yellow trichomes, hispid to strigose on the upper parts, or distally glabrous. Corollas (2–)3–6 cm long, funnellform, purplish to blue, at times white or red, the tube white or yellow within, glabrous. **Capsules** 8–12 mm long, rounded-depressed, 3-locular, brown, glabrous. Seeds 1–4(–6), 4–9 mm long, dark brown to black, densely short-pubescent.  $2n = 30$ .

*Sonora*.—Near the margins of the Sonoran desert, coastal and foothill thornscrub, and tropical deciduous forest, in disturbed as well as natural habitats; 50–ca. 1400 m. Growing and flowering mostly following warm weather rains, especially August–October.

*General distribution*.—Mexico (probably most or all states); Mesoamerica; Argentina, Bolivia, Brasil, Colombia, Guyanas, Ecuador, Venezuela; Caribbean; cultivated and introduced into the Old World.

The seeds have been utilized as a laxative (Austin 2000c). There are three species of somewhat similar-

appearing morning glories that are often confused. One is *I. nil*, characterized by long, straight, subulate sepals, in tropical regions worldwide. The second is *I. hederacea*, also characterized by long sepals, but curving and with an ovate base and abruptly attenuate apex, in temperate regions by latitude or higher elevations in tropical latitudes. The third member is *I. purpurea*, which has short fat sepals and is worldwide.

*Ipomoea nil* and *I. hederacea* can be hybridized with difficulty (Yoneda and Takenaka 1981). Historically they were geographically isolated. Superficially *I. nil* seems similar to *I. hederacea*, but detailed morphological and molecular genetics show that they are not as close as they may seem. Furthermore, *I. nil* seems closer to *I. ericalyx* Mart. of South America than to *I. hederacea* (Austin et al. 2001).

*Selected references.*—Austin (2000c), Austin et al. (2001), McDonald et al. (2011).

**Mpio Agua Prieta:** Colonia Morelos, 2600 ft, flowers blue, juice milky, 15 Sep–4 Oct 1941, *White 4110!* **Mpio Álamos:** Álamos, 16 Oct 1936, *Gentry 2929!*; Algodones, 9 Sep 1935, *Gentry 1683!*; San Bernardo, tropical Sonoran, valley, 6 Sep 1935, *Gentry 1670!*; Between Rancho La Junta on Río Mayo and Guajaráy on Arroyo Guajaráy, 27°35'15"–27°36'N, 108°52'–108°55'45"W, 220–270 m, 18 Mar 1993, *Van Devender 93-433!*; Güirocoba crossing of Río Chujujaqui, 12.3 km (by air) S-SE of Álamos, 26°56'15"N, 108°53'W, 260 m, 28 Jan 1992, *Van Devender 92-24!*; SE edge Álamos, 380 m, 10 Mar 1993, *Van Devender 93-108!*; Rancho La Junta, 1 km upstream from Mesa Colorada, 3 km (by air) N-NE of Burapaco, junction of Arroyo Guajaráy and Río Mayo, 27°35'15"N, 108°52'W, 220 m, 17 Mar 1993, *Van Devender 93-390!* **Mpio Arizpe:** Rancho Agua Caliente, 3 km S-SE of Arizpe, foothills thornscrub, 30°19'37"N, 110°11'33"W, 920 m 16 Sep 2000, *Reina-G. 2000-736!* **Mpio Carbó:** 12.3 mi by Tecolote road (1.2 mi N of El Oasis) W of MEX 15, 725 m, 24 Aug 1982, *Reichenbacher 1064* (ARIZ!; mixed collection, upper buds are *I. hederacea*, the full flower at bottom is *I. nil*, ASU!). **Mpio Cucurpe:** Canyon bottom, Palm Canyon, SE of Magdalena, 1 Oct 1979, *Toolin 430!*; Floodplain near Rancho Agua Fria, E of Cucurpe, *Van Devender 6 Sep 1976!* **Mpio Hermosillo:** 15 mi S of Hermosillo, mesquite bottomland, 6 Sep 1939, *Gentry 4564!* **Mpio Huachineras:** Horconcitos, Río Huachinera, flowers blue, 6 Sep 1940, *White 3733!* **Mpio Ímuris:** 8 km NE of Ímuris on Mex. 2, mesquite scrub on slopes above rocky canyon, uncommon herbaceous vine on disturbed roadside, flowers closed at 11:30 a.m., 15 Sep 2000, *Van Devender 2000-703* (ASU!). **Mpio Moctezuma:** 18.1 km S-SE of Moctezuma on road to Tepache (SON 117), 29.6583°N, 109.6103°W, 632 m, basalt cobble plain with dwarf foothills thornscrub, uncommon herbaceous vine, flowers white with tips drying purple, 14 Sep 2006, *Reina-G. 2006-827!* **Mpio Navojoa:** Navojoa, 27 Oct 1939, *Gentry 4752a!* **Mpio San Javier:** 1.6 km NW of San Javier turnoff on Mex 16, 28°34'23"N, 109°46'09"W, 490 m, flowers blue, open at 6:47 a.m., tropical deciduous forest, 28 Aug 2000, *Van Devender 2000-481!* **Mpio Soyopa:** Yaqui River, El Toledo, 28°34'N, 109°33'50"W, 200 m, *Martin 8 Oct 1988!*; Río Yaqui bridge on MEX 16, just S of Tónichi, 200 m, 21 Sep 1997, *Reina-G. 97-943!* **Mpio Yécora:** 3 km N of Tepoca on MEX 16, tropical deciduous forest, 28°27'18"N, 109°15'38"W, 770 m, 10 Sep 1994, *Bárquez 94-090* (FTG-FAU!); 0.9 mi W of Santa Rosa, 3120 ft, 9 Aug 1976, flowers blue fading purple, *Goldberg 76-254!*; La Concepción, 29°19'25"N, 109°02'20"W, 650 m, *Traub 18 Jul 1997* (FTG-FAU!); Santa Ana 2 km E-NE of town just beyond Bermudez Junction, 28°22'40" N, 109°08' W, 950 m, *Martin, Ottis, et al. 10 Oct 1988!* **Mpio unknown:** near 50-mile Pass, W of Rancho Verruga, 23 Oct 1932, *Shreve 6026!*

***Ipomoea parasitica* (Kunth) G. Don, Gen. Hist. 4:275. 1838.** TYPE: VENEZUELA: *Humboldt & Bonpland 660* (HOLOTYPE: B, microfiche!). *Convolvulus parasiticus* Kunth, Nov. Gen. Sp. (quarto ed.) 3:103. 1818 [1819].

*Ipomoea perlonga* B.L. Rob., Proc. Amer. Acad. Arts 21:319–320. 1894. TYPE: MEXICO. JALISCO: Tequila, 15 Oct 1893, *Pringle 4519* [incorrectly published as 4531] (HOLOTYPE: GH!, ISOTYPES: BKL!, FI!, GOET!, K!, MA!, NY!, P(3)!, PH!).

**Herbs**, annual, the stems twining, herbaceous, to 2–7 m long, with fleshy tubercles on the older parts, or smooth, glabrous or glabrate. **Leaves** 5–10 cm long, 6–9 cm wide, entire, cordate to broadly cordate, apically acuminate to rounded and cuspidate, lightly pubescent or glabrous above, mostly glabrous below. **Inflorescences** usually simple cymes, less often compound-cymose. **Flowers** 2–10. Sepals 4–6 mm long, more or less equal, the outer ones ovate to ovate-lanceolate, more or less acute and cuspidate, with small appressed-puberulent indumentum. Corollas 2.5–3 cm long, funnellform, purple, sericeous on the interplacae. **Capsules** 10–12 mm long, ovoid to ovoid-globose, reflexed, glabrous. Seeds 1–4, 6–7 mm long, narrowly ellipsoidal, brown, with small puberulent indumentum or glabrous.

**Sonora.**—Eastern Sonora in Chihuahuan desert, foothills thornscrub, tropical deciduous forest, and riparian in oak woodland; 260–1290 m. Flowering November to February. Although not known from the United States, its occurrence at Agua Prieta suggests that it might be found in nearby Arizona.

**General distribution.**—Baja California Sur, Chiapas, Chihuahua, Guanajuato, Guerrero, Jalisco, Edo. México, Michoacán, Morelos, Nayarit, Oaxaca, Sinaloa, Veracruz; Mesoamerica; Brazil, Colombia, Peru, Venezuela.

These plants contain an ecdysone that was considered at one time as a potential insecticide. Subsequently, the same or similar compounds were found in *I. nil* and became commercially known as “kaladana” (Austin 2000c).

**Mpio Agua Prieta:** Isolated hill NE of Sierra Anibacachi, Rancho La Calera, 10 km (by air) SW of Agua Prieta, 31.2331°N, 109.6314°W, 1287 m, uncommon annual vine on rocky slope; flowers purple, Chihuahuan desertscrub on limestone, 2 Oct 2004, *Van Devender 2004-1117!*  
**Mpio Álamos:** Álamos, 21 Oct 1961, *Gentry 19349!*; Algodones, 700 m, 9 Sep 1935, *Gentry 1682!* **Mpio Arizpe:** Agua Caliente, 19 km N of Ímuris, 5 km N of Mesa del Romero on Mex 15, cottonwood-willow forest in ciénega, 30.9531°N, 110.8525°W, 980 m, herbaceous vine to 3.5 m in tree, dried flowers purple, closed in midday, 15 Aug 2001, *Reina-G. 2001-656!* **Mpio Cucurpe:** Palm Canyon, 17 mi SE of Magdalena, 27 Sep 1990, *Van Devender 90-468A!* **Mpio Imuris:** Puente Caliente, Rancho Agua Caliente, 3 km S of Arizpe on SON 89, 30.3269°N, 110.1925°W, 920 m, foothills thornscrub, very common, flowers magenta with white tube, white sepals extending into corolla, 16 Sep 2000, *Reina-G. 2000-739!* **Mpio Villa Pesqueira:** 2.5 mi N of Mátape, between Mátape and Batuc, 2350 ft, 11 Sep 1941, *Wiggins & Rollins 467!* **Mpio San Javier:** W side of Sierra del Aliso, N of Cerro El Halcón, deep canyon with permanent water and *Platanus racemosa* gallery forest, 28°38'15"N, 109°43'30"W, 800 m, 31 Jul 1996, *Búrquez M. 96-328 (FTG-FAU!)*; Cerro Verde, SW of San Javier, 28°33'55"N, 109°44'10"W, 800 m, 30 Sep 1996, *Varela E. 96-415 (FTG-FAU!)*; Arroyo El Carbón, near San Javier, 28°35'N, 109°42'40"W, 700 m, 5 Oct 1996, *Varela E. 96-431 (FTG-FAU!)*.

***Ipomoea pedicellaris* Benth., Bot. Voy. Sulph. 135. 1845.** TYPE: HONDURAS: Valle, Gulf of Fonseca, Tiger Island, *Sinclair s.n.* (LECTOTYPE: K!); MEXICO. GUERRERO: *Sinclair s.n.* (SYNTYPE: K!; ISOSYNTYPES: BM!, K!). Austin (1997) had not seen either of the syntypes nor had he seen the paper where Cyrillo Nelson (*Fontqueria* 44:58. 1996) selected the Honduras specimen as lectotype. McDonald was also in error when he annotated the Honduras specimen as the holotype in October 1982.

*Ipomoea grayi* Rose, *Contr. U.S. Natl. Herb.* 1:107. 1891. TYPE: MEXICO. SONORA: Álamos, 16–30 Sep 1890, *Palmer 710* (LECTOTYPE: US!; ISOLECTOTYPE: (2) K!); MEXICO. CHIHUAHUA: Aug–Nov 1885, *Palmer 102* (SYNTYPES: NY!, US!).

*Ipomoea breedlovei* L.O. Williams, *Fieldiana, Bot.* 32:188. 1970. TYPE: MEXICO. CHIAPAS: wooded slope 9 km N of Tuxtla Gutiérrez along road to El Sumidero, Mun. of Tuxtla Gutiérrez, alt. 2200 ft, 18 Oct 1965, *Breedlove 13871* (HOLOTYPE: F!, ISOTYPES: CAS!, DS!, MICH!).

MANTELA DE MARÍA, TROMPILLO; JÍCURE 'TWISTED YARN' (Mayo)

**Lianas**, perennial, the stems 2–10 m long, twining with a woody base, often winged, the younger parts herbaceous, smooth to somewhat winged, glabrous or pubescent. **Leaves** 3.5–14 cm long, 3–12 cm wide, ovate, often broadly ovate, entire or 3- or 5-lobed, chartaceous, basally cordate, apically acuminate, glabrous or pubescent on both surfaces at least near the base. **Inflorescences** cymose, axillary. **Flowers** (2–)5–15(–35). Sepals unequal; the 2 outer sepals 4–7 mm long, ovate-lanceolate, broadly elliptic to oblong, acute, muricate or more often with wings on the lower portion; inner sepals 5–8.5 mm long, obtuse to obtuse-mucronate, coriaceous, the margins scarious, glabrous or pubescent only toward the apex. Corollas 5–9 cm long, funnellform, purple, slightly pubescent at the apices of the petals. **Capsules** 10–19 mm long, ovoid, brown, apiculate, glabrous. Seeds 1–4, 6–7 mm long, ellipsoid, brown, minutely puberulent or glabrescent.

**Sonora.**—Central and southern parts of the state in coastal and foothills thornscrub and tropical deciduous forest; ca. 50–550 m. Flowering September to November. The seeds, ground, roasted, and boiled, were used by the Guarijíos as a purgative (Gentry 1942). The Guarijíos also used a morning glory, possibly this species, as follows: "If a woman does not wish to have a child, she will sometimes eat the seeds of *trompillo*, grinding up the seeds, mixing the gruel into water, and drinking it" (Yetman & Felger 2002:193). The Mayos consider the herbage of this fast-growing summer vine to be valuable forage for cattle and goats (Yetman and Van Devender 2002).

**General distribution.**—Chiapas, Chihuahua, Colima, Guerrero, Hidalgo, Jalisco, Michoacán, Morelos, Nayarit, Oaxaca, Puebla, San Luis Potosí, Sinaloa, Tamaulipas, Veracruz; Mesoamerica.

**Selected reference.**—Austin (1997).

**Mpio Álamos:** San Bernardo, 24 Aug 1935, *Gentry 1616!*; Río Mayo Raft Trip, confluence of Río Mayo with San Ignacio, 27°55'N, 108°47'W, *Jenkins & Rondeau 26 Sep 1991!*; 23.3 mi by road W of Álamos, *Soule & Krizman 28 Aug 1964!*; Arroyo el Mentidero at El Chinal road, 11.3 km S of Álamos, 26°54'45"N, 108°55'05"W, 240 m, 20 Sep 1993, *Van Devender 93-855!*; Álamos, 28 Sep 1991, *Van Devender 91-755!*; Gueybampo, E edge of Arroyo Tojibampo, 26°42'30"N, 109°16'W, 50 m, 22 Sep 1994, *Van Devender 94-713!*; 0.3 km E of Tojibampo (S side of the Sierra de Álamos), 26°48'50"N, 108°58'W, 240 m, 21 Sep 1994, *Van Devender 94-659!*; Arroyo Huirotal, Rancho Las Uvalamas, E slopes of Sierra de Álamos, 550 m, vine 6–8 m in trees, flowers purple, 13 Sep 1994, *Van Devender 94-564 (ARIZ!, ASU!)*. **Mpio Huatabampo:** 1 km SE of Cerrillos, 9.5 km SE Melchor Ocampo, 40 m, flowers purple, 21 Sep 1994, *Friedman 347-94 (ASU!)*. **Mpio La Colorada:** 7 mi NE of Colorado, between Colorado and Mazatán, climbing vine to 8 or 10 m, corolla rich purple, 6 Sep 1941, *Wiggins & Rollins 323 (CAS!)*; 3.5 km SE de San Jose de Pimas, 8 km antes del entronque a rancho San Francisco, por carretera 16, cerca del km 76 de Hermosillo, 28°41'45"N, 110°10'25"W, 380 m, 6 Sep 1995, *Reina-G. 95-428!* **Mpio Navojoa:** Teacheve de Masiaca, 75 m, 21 Sep 1994, *Van Devender 94-670!*; Near Las Guásimas, road from Navojoa–Álamos, sandy bottomlands, thorn forest, seeds used as purgative, *Mantela de Maria*, 5 Nov 1939, *Gentry 4880!*

***Ipomoea pes-caprae*** (L.) R. Br. in Tuckey subsp. ***brasiliensis*** (L.) Ooststr., *Blumea* 3:533. 1940. TYPE: based on illustration by Plumier, *Descr. Pl. Amer.* t. 104, 1693 (LECTOTYPE!). *Convolvulus pes-caprae* L., *Sp. Pl.* 159. 1753. TYPE: herb. *Linnaeus* (LINN 218.59!).

*Convolvulus brasiliensis* L., *Sp. Pl.* 159. 1753.

BATATILLA, CHURRISTATE DE PLAYA; BEJUCO DE PLAYA; BEACH MORNING GLORY, RAILROAD VINE, GOAT-FOOT MORNING GLORY, BAYHOPS

**Herbs**, perennial, the stems mostly prostrate on beaches, rarely twining, fleshy, to 10 m long (usually much shorter in Sonora), glabrous, and with milky sap. **Leaves** 3–10 cm long, 5–10 cm wide, ovate to reniform, basally rounded, truncate to cordate, apically normally emarginate, the blade with 2 glands near the base. **Inflorescences** axillary, monochasial and/or dichasial. **Flowers** 1–5. Sepals 5–11 mm long, equal or unequal, elliptic, ovate-elongate to orbicular, glabrous. Corollas 5–6 cm long, funnellform, pinkish or lavender, the throat darker within, glabrous. **Capsules** 1.5–2.2 cm long, rounded, straw-colored or brown with purplish patches, glabrous. Seeds 1–4, 8–9 mm long, rounded, densely brown-tomentose.  $2n = 30, 60$ .

**Sonora.**—Cultivated on beaches from the vicinity of Bahía Kino southward and sometimes weakly established, and perhaps native or at least established on beaches along coastal thornscrub in extreme southwestern Sonora; near sea level. Flowering at least during the warmer months.

**General distribution.**—This species occurs on beaches and coastal dunes worldwide; subsp. *brasiliensis* is widespread in the New World tropical shores. Texas; Baja California (norte) and Sur, Chiapas, Guerrero, Jalisco, Michoacán, Oaxaca, Sinaloa, Tamaulipas, Veracruz; Mesoamerica; Brasil, Colombia, Ecuador, Guyanas, Peru, Venezuela; Caribbean. Subspecies *pes-caprae* occurs in a narrow range in the Indian Ocean. A close relative, *I. asarifolia* (Desrousseaux) Roemer & Schultes, has been introduced into wetlands in the American tropics (Austin 2005).

**Selected reference.**—St. John (1970).

**Mpio Hermosillo:** Bahía Kino, on coastal sand dunes growing wild on seaward facing aspect of dune faces, *Lindsay* 12 Jun 1989! **Mpio Huatabampo:** Huatabampito vicinity 4 km (by air) S of Moroncorit, 26.6917°N, 109.587°W, common perennial vine in sand dunes near houses, 23 Sep 1994, *Friedman* 344-94 (ASU!); 1.7 km (by air) S of Las Bocas, 26.65°N, 109.331°W, sea level, solitary perennial herb in sand, milky latex when stem broken, 9 May 1996, *Friedman* 43-96 (ASU!).

***Ipomoea plummerae*** A. Gray. *Syn. Fl. N. Amer.*, ed. 2, 1:suppl. 434. 1886. TYPE: U.S.A. ARIZONA: 1882, *Lemmon* 2839 (HOLOTYPE: GH!; ISOTYPE: UC(2)!).

*Ipomoea egregia* House, *Torreya* 6:124. 1906. New name for *I. cuneifolia* A. Gray. *I. cuneifolia* A. Gray, *Proc. Amer. Acad. Arts* 19:90. 1883. TYPE: U.S.A. ARIZONA: *Lemmon* 2837 (HOLOTYPE: GH!; ISOTYPES: MO!, UC!, US!), not *I. cuneifolia* Meisn. in Mart. (1869). *Ipomoea plummerae* var. *cuneifolia* (A. Gray) J.F. Macbr., *Publ. Field Mus. Publ. Nat. Hist. Bot. Ser.* 11:4. 1931.

Perennial **herbs** with globose, tuberous roots, the stems erect to procumbent, ascending, not twining or only slightly at tips, glabrous. **Leaves** 1–3 cm long, orbicular in outline, palmately and pedately lobed (rarely cuneate-obovate in which case the apex is laciniate-dentate), basally cordate, the lobes acute, glabrous; petioles 2–5 mm long. **Inflorescences** solitary. **Flowers** on peduncles 1.5–2.5 cm long, erect or reflexed in fruit; bracts caduceous. Sepals unequal; outer sepals 5–8 mm long, 2–3 mm wide, oblong, obtuse to acute, mucronate, muriccate at least along the midrib; inner sepals 7–9(–10) mm long, 3–4 mm wide, broadly ovate, acute to acuminate, muriccate on the midrib or glabrous. Corollas funnellform, 2.5–3.1 cm long, purple, glabrous, the limb 1.8–2.2 cm wide. **Capsules** ± globose, 5–6 mm wide, with an apiculum to 5 mm long. Seeds 1–4, 2–2.5 mm long, ovoid, black to dark brown, finely tomentose.

**Sonora.**—At least in southern Sonora, coastal thornscrub and in pine-oak forest in southeastern Sonora near the Chihuahua border. Also southeastern Arizona near the border and expected in nearby Sonora and perhaps elsewhere in mountains in eastern Sonora. Open rocky slopes. 20–above 1250 m. Flowering April–October;

**General distribution.**—Arizona, New Mexico, Texas; Chihuahua, Coahuila, Distrito Federal, Durango, Hidalgo, Jalisco, Edo. México, Michoacán, Puebla, Veracruz, Zacatecas; Argentina, Bolivia, Peru. McDonald (1995) recognized several widespread varieties, with the Sonoran population being var. *plummerae*.

Although McDonald (1995) recognized var. *cuneifolia* as distinct, DFA has seen individual populations in southern Arizona with both “var. *cuneifolia*” and “var. *plummerae*” growing intermixed. We suspect that the two “varieties” are nothing more than variants in leaf shapes.

This species is easily confused with *I. capillacea*. Leaf segments are <1 mm wide in *I. capillacea*, and >1 mm wide in *I. plummerae*. Also, *I. capillacea* is an erect herb, while *I. plummerae* is a prostrate or rarely twining herb.

*Selected reference.*—McDonald (1995).

**Mpio Álamos:** Cliffs 5 km W of Chiribo, Sierra Saguaribo, 1400 m, pine-oak woods, *Martin* 24 Aug 1993. **Mpio Yécora:** Yécora, 28°22'25"N, 108°56'W, 1540 m, 6 Sep 1995, *Reina-G.* 96-373. **CHIHUAHUA. Mpio Buenaventura:** Río Santa María, 10 km SW of Buena Ventura [Buena Ventura], 2100 m, 14 Aug 1989, *Jenkins et al.* 89-311.

***Ipomoea pubescens*** Lam., *Tabl. Encycl.* 1:465. 1791 [1793]. TYPE: AMERICA: collector unknown (ISOTYPE: K!).

*Ipomoea heterophylla* Ortega, *Nov. Pl. Descr. Dec.* 1:9. 1707. TYPE: MÉXICO: horto Regio, 1797. *Ortega* (lectotype MA!, photo FTG-FAU!).

*Ipomoea lindheimeri* var. *subintegra* House, *Ann. New York Acad. Sci.* 18:196. 1908. TYPE: U.S.A. ARIZONA: *Lemmon* 2835 (HOLOTYPE: GH!).

Perennial **herbs** from a large, oblong root; stems twining, hirsute with retrorse trichomes. **Leaves** with blades 2–8 cm long, 2–9 cm wide, ovate, nearly entire with the margins sinuate, or 3- or 5-lobed and palmate, basally cordate, the lobes elliptic to ovate, hirsute with antrorse trichomes, at times sericeous, apically acute to obtuse, mucronate; petioles 2–5 cm long. **Inflorescences** 1- or 2-flowered. **Flowers** on peduncles 15–18 mm long; pedicels 3–10 mm long, erect in fruit; bracts 5–12 mm long, subulate, acuminate. Sepals unequal; outer sepals, 9–21 mm long, 5–11 mm wide, ovate, basally truncate, acuminate; middle sepals 9–19 mm long, 3–8 mm wide, asymmetrical, ovate, acuminate; inner sepals 9–20 mm long, 2–4 mm wide, ovate-lanceolate, antrorsely hispid, at times sericeous. Corollas 5.5–8 cm long, funnellform, blue to violet with a white throat, glabrous, the limb 6–7 cm wide. **Capsules** 10–12 mm wide, ± globose, surrounded by the sepals. Seeds (1–) 3–6, 5–6 mm long, ovoid, brown to black, densely hairy with velvety trichomes.

**Sonora.**—Mountains in eastern Sonora. It grows in south-central and southeastern Arizona near the border and is expected in nearby Sonora. Oak woodland and pine-oak forests, especially rocky areas and near streambeds; ca. 1200–2000 m. Flowering August–September.

**General distribution.**—Arizona, New Mexico, Texas; Chihuahua, Durango, Hidalgo, Michoacán, Querétaro, San Luis Potosí; disjunct to South America.

The Arizona plants have larger flower than those listed from South America by O'Donnell (1959a) and there is perhaps more than one taxon involved. McDonald et al. (2011) have placed all the large-flowered plants of northern Mexico and the SW United States in *I. lindheimeri*. We cannot agree because the sepals are distinct within the populations that we have studied in Sonora and Arizona. McDonald (pers. comm., June 2012) says that he has found what appear to be hybrid swarms between the typical *I. lindheimeri* with narrow lanceolate-linear, cuneate sepals and plants of *I. pubescens* with broadly ovate, basally truncate sepals. We have not seen such populations and maintain them as separate species until future studies can be made of their relationships.

*Selected reference.*—Austin (1991).

**Mpio Álamos:** Sierra Saguaribo, Chiribo, 1400 m, *Martin* 24 Aug 1993!; Sierra Sahuaribo, ca. 2 km (by air) NE of La Vinateria, 27°17'30"N, 108°41'30"W, 1300 m, 24 Aug 1993, *Steinmann* 93-275! **Mpio San Felipe de Jesús:** Cajón Infierno, northern Sierra Aconchi, 4480–5120 ft. oak woodland, rare, one patch along streambottom in narrow part of canyon, 18 Sep 1982, *Reichenbacher* 1139! **Mpio Yécora:** Restaurant La Palmita, 9.5 km W of Restaurant Puerto de la Cruz on Mex 16 (km 258 E of Cd. Obregón), N side of Mesa del Campanero, 28°22'18"N, 109°03'53"W, 1460 m, oak woodland, locally common on grassy slope in shady canyon, flowers blue with white throat, drying magenta, open 9:00 a.m., 31 Aug 2000, *Reina-G.* 2000-561 (USON!).

***Ipomoea purpurea*** (L.) Roth, *Bot. Abh. Beobacht.* 27. 1797. TYPE: Dillenius, *Hort. Eltham.* 1:100. t. 84, f. 97, 1732 (LECTOTYPE!).

*Convolvulus purpureus* L., *Sp. Pl.*, ed. 2, 1:219. 1762.

*Ipomoea hirsutula* Jacq. f., *Ecl. Pl. Rar.* 1:63, t. 44, 1811 [1813]. TYPE: no specimen known, plate is the lectotype. *Pharbitis hispida* Choisy.

*Convolv. Orient.* 56. 1833; *Mem. Soc. Phys. Genève* 438. 1833, nom. illegit. pro syn.

*Ipomoea diversifolia* Lindl., *Edward's Bot. Reg.* 23:pl. 1988. 1837. TYPE: based on *Dickson* (HOLOTYPE: if extant OXF). *Ipomoea purpurea* (L.)

Roth var. *diversifolia* (Lindl.) O'Donnell, *Lilloa* 26:385. 1953.



## TUTUGIOCHSKI (PIMA BAJO FOR "BLUE FLOWER")

Annual **herbs**; stems twining, simple or branched. Plants loosely strigose to tomentose with three kinds of trichomes: short and appressed; retrorse and often large; and antrorse, oblique to erect trichomes that reach 4 mm long. **Leaves** 1–11 cm long, 1–12 cm wide, ovate, ±3-lobed or rarely 5-lobed, also entire, basally cordate, apically acute to acuminate, rarely obtuse, mucronate; petioles 1–14 cm long. **Inflorescences** cymose, axillary. **Flowers** (1–) 2–5, on pedicels 5–16 mm, erect in flower, reflexed and enlarged in fruit, reaching 25 mm long. Sepals ± equal; outer sepals 8–15 mm long, (1.5–) 2.5–4.5 mm wide, ovate-lanceolate or narrowly ovate-lanceolate to elliptic, acute to abruptly acuminate apically, more pubescent near the base; inner sepals 8–15 mm long, 2.5–3 mm wide, ovate-lanceolate, acute to abruptly acuminate. Corollas 2.5–4.3(–5) cm long, funnellform, glabrous, blue (white to purple in cultivated plants), white within the tube, the limb 2.4–4.8(–7) cm wide. **Capsules** ± globose to ovoid, 7–8(–10) mm wide, with an apiculum 2–4 mm long, 6-valvate. Seeds 3–6, 4–5 mm long, ovoid, black to dark brown, finely tomentose.  $2n = 30$ .

**Sonora.**—Widespread across the state except in the desert in the northwest; Sonoran desert, tropical deciduous forest, oak woodland, often in disturbed sites, cultivated fields, and grown as an ornamental. Flowering July–November; 100–2300 m.

**General distribution.**—Pantropical, widespread in North America, including Arizona, New Mexico, Texas; probably naturalized from Mexico where it is documented in all states except Baja California (norte) and the Yucatan peninsula.

This is an unusually variable species, at least in part due to cultivation. Cultivated forms are larger than the wild forms, but the size of flowers and sepals may vary even in the wild plants (see discussion under *I. nil*).

**Mpio Álamos:** Álamos, cultivated annual on fence near house, 20 Sep 1993, *Van Devender* 93-822! **Mpio Cananea:** 3 km S-SE of Cananea on Son 89, 30.9819°N, 110.2431°W, 1565 m, common in disturbed roadside, flowers closed at 5:20 p.m., 15 Sep 2000, *Van Devender* 2000-676!

**Mpio Cumpas:** 5 km ESE of Jécori, road to Moctezuma, 26 Oct 1984, *Felger* 84-379! **Mpio Soyopa:** Loma Maderista, 3.5 km S of Tonichi, W side Río Yaqui, foothills thornscrub, 28°34'03"N, 109°33'25"W, 220 m elev, *Van Devender* 2110-192! **Mpio Yécora:** Yecora, 28°22'25"N, 108°56'W, 1540 m, in yard, 20 Oct 2000, *Reina-G.* 2000-861!; Along Arroyo El Kipor (Quipor), E of El Kipor on trail to Tierra Panda, 28°24'N, 108°33'35"W, 1640 m, 10 Sep 1995, *Van Devender* 95-943!; Mesa de los Coronados, S side of Mesa del Campanero, 28°19'31"N, 109°01'40"W, 2100 m, flowers blue with lavender throat and white base, turning magenta, open 10:00 A.M., 1 Sep 2000, *Van Devender* 2000-581 (ASU!).

***Ipomoea quamoclit* L., Sp. Pl. 159. 1753.** TYPE: INDIA: herb. Clifford: 66, *Ipomoea* 1 (LECTOTYPE: BM-000558077!).

*Convolvulus pennatus* Desr. in Lam., *Encycl. Méth. Bot.* 3:567. 1789 [1792]. TYPE: Cette plante croît dans les Indes orientales, & est cultivée au Jardin du Roi (there are 2 sheets at P-LAM!, the one with the label in the lower left corner annotated as "Dict. no. 107" chosen here as lectotype; the second sheet is an isotype). *Quamoclit pennata* (Desr.) Bojer, *Hortus Maurit.* 224. 1837.

*Quamoclit vulgaris* Choisy, *Mem. Soc. Phys. Genève* 6:434. 1834. New name for *I. quamoclit* L.

## STAR MORNING GLORY, STAR GLORY

**Herbs**, annual, herbaceous, the stems twining to 5 m long, glabrous, or sometimes with glandular trichomes on the leaf surface (e.g., *Wiggins & Rollins* 374). **Leaves** 1–9 cm long, 0.5–4.5 cm wide, pinnatisected, with 9–19 pairs of linear lobes, glabrous. **Inflorescences** in monochasial cymes. **Flowers** 1–3. Sepals unequal, the outer sepals a little shorter than the inner ones, 4–8 mm long, elliptic, mucronate, glabrous. Corolla 2–3 cm long, salverform, red, glabrous. **Capsules** 6–10 mm long, conic, brown, glabrous. Seeds 1–4, 4–5 mm long, pyriform, black, with patches of short trichomes.  $2n = 30$ .

**Sonora.**—Southeastern and east-central Sonora. Tropical deciduous forest, often in thickets and edges of forests; 220–1500 m. Flowering June–October.

**General distribution.**—Texas, southeastern United States; Baja California Sur, Chiapas, Chihuahua, Guerrero, Jalisco, Edo. México, Michoacán, Nayarit, Oaxaca, Sinaloa, Tabasco, Veracruz, Yucatan; Mesoamerica; Argentina, Bolivia, Brasil, Colombia, Ecuador, Guyanas, Peru, Paraguay, Venezuela; Caribbean; introduced to the Old World and cultivated.

This species was almost certainly brought into cultivation by the Aztecs of central Mexico. The specific name has been claimed to be derived from the Greek *kuamos*, bean, and *klitos*, low, dwarf (De Théis 1810:242), but that is incorrect. In fact, the Oxford English Dictionary (OED online 2012) notes that the name came from Nahuatl; it was in European literature by the middle 1550s and on a herbarium specimen from 1583.

**Mpio Álamos:** Canyon Estrella, Álamos, 1 Oct 1933, *Gentry 408M!*; Álamos, 28 Oct 1939, *Gentry 4760 (MO!)*; San Bernardo, 15 Oct 1934, *Gentry 1059 (MO!)*; Arroyo Guajaray, 310 m, 15 Mar 1994, *Fishbein 1560!*; Güirocoba crossing of Río Cuchujaqui, 12.3 km (by air) SSE of Álamos, 26°56'15"N, 108°53'W, 260 m, 4 Oct 1992, *Van Devender 92-937 (ASU!)*; Arroyo Los Cochis, NW side of La Gacela, 26°52'20"N, 108°52'10"W, 220 m, 2 Dec 1994, *Van Devender 94-876!*; El Guayabo crossing of Río Cuchujaqui, 2.6 km NE of Sabinito Sur, 14 km (by air) E-SE Álamos, 12 Oct 1992, *Van Devender 92-1227!* **Mpio La Colorada:** 10 mi S of Mazatán, between Mazatán and Colorado, herbage viscid, 7 Sep 1941, *Wiggins & Rollins 374 (ARIZ!, CAS!, MO!)*. **Mpio Sahuaripa:** Arroyo la Ventana, Rancho La Ventana, 32.6 km (by air) NNE of Sahuaripa, northern Jaguar Reserve, 29.3225°N, 109.10194°W, 745 m, rocky canyon, riparian forest in rocky stream canyon, foothills thornscrub on slopes, 1 Sep 2009, *Reina-G. 2009-698!* **Mpio Yécora:** 2.7 mi W of Santa Ana de Yécora, 2315 ft, 11 Aug 1976, *Goldberg 76-285!*; About 1.5 mi W of Santa Rosa, between mine and town, ca. 2770 ft, 10 Aug 1976, *Goldberg 76-258!*; E-NE of Santa Rosa just beyond Bermúdez Junction, 28°22'40"N, 109°08'W, *Martín 10 Oct 1988!*; 3 km NE of Santa Ana, 960 m, 9 Sep 1996, *Reina-G. 96-556!*

***Ipomoea scopulorum*** Brandegees, *Zoë* 5:169. 1903. TYPE: MEXICO. BAJA CALIFORNIA [SUR]: Cape Region, 1902, *Brandegee s.n.* (HOLOTYPE: UC!, photo FTG-FAU!).

Perennial twining **herbs**, with tuberous roots?, 1–2 m long, sparsely to densely pubescent throughout with simple and stellate trichomes. **Leaves** 6–8 cm long, 4–6 cm wide, cordate-ovate, entire, stellate-pubescent above and below; petioles 2–5 cm long. **Inflorescences** cymose or solitary, axillary. **Flowers** on peduncles 2–9 cm long, the pedicels 2–3 cm long, erect in fruit; bracts 2–3 mm long, subulate, caducous. Sepals 7–10 mm long, 4–6 mm wide, unequal, broadly oblong to broadly ovate, smooth, rounded to obtuse, the upper margins somewhat scarious, glabrous or less often sericeous on the outside of the outer two sepals. Corollas 6–8 cm long, 6–7 cm wide, funnellform, white with a purple throat or less often purplish throughout, glabrous. **Capsules** ovoid, 10–14 mm long, 8–10 mm wide. Seeds 1–4, 6–8 mm long, ovoid, brown, silky, with white or tawny trichomes 8–10 mm long on the margins, otherwise glabrous.

**Sonora.**—Southern to north-central parts of the state; Sonoran desert, coastal and foothills thornscrub, and tropical deciduous forest; 150–725 m. Flowering August–September.

**General distribution.**—Baja California Sur, Sinaloa.

**Mpio Álamos:** 2 mi N of Taymuco, corolla white with purple throat, 9 Aug 1980, *Lehto 24800 (ASU!)*; San Bernardo, large white flowers, attracting bees and small butterflies, 13 Aug 1934, *Gentry 1574!* (ARIZ!, MO!); 5 mi S of junction of Álamos–Navojoa road and road to Moczari [Macúzari] Dam, *Warren & Goldberg 17 Aug 1975!* **Mpio Cajame:** Ciudad Obregón, malapias promontory in foothill valley, 29 Sep 1933, *Gentry 280!* **Mpio Carbó:** 12.3 mi by Tecolote Rd (1.2 mi N of El Oasis) W of Mex Hwy 15, 725 m, 29°46'40"N, 111°15'00"W, 22 Aug 1982, *Reichenbacher 1058!* **Mpio Huatabampo:** 9 km S of Estación Luis, 1 km W of Francisco Sarabia, Sinaloan thornscrub, 150 m, flowers white, 14 Aug 1994, *Friedman 221-94!*; 2.5 mi W of Hwy 15 on Hwy 176 to Huatabampo, ca. 14 mi (airline) E of Huatabampo, 109°24.5'W, 26°50'N, 50 m, coastal thorn scrub on flats, 7 Oct 1992, *Sanders 12706 (UCR!)*. **Mpio Navojoa:** Summit of Cerro Prieto, 15 km E of Navojoa, thorn forest, 400 m, flowers white, this plant wilts very quickly when cut, 5 Sep 1989, *Sanders 9261!*; SSW of Cerro Masiaca, E side of Hwy 15, 8.8 mi S of jct with Hwy 176, near 26°45'N, 109°18'W, 50 m, alluvial slope with thorn scrub forest, solitary vine growing 1.5 m high on a tree, 7 Oct 1992, *Sanders 12695 (UCR!)*. **Mpio Sahuaripa:** 8 km N of Río Yaqui on road to Tepache, tropical riparian in deep canyon with foothills thornscrub on slopes, 29°14'55"N 109°18'51"W, 422 m, solitary vine in shady area, flowers white, deep purple inside throat, open at 9:00 a.m., 17 Aug 2003, *Reina-G. 2003-937!* **Mpio Soyopa:** Río Yaqui, 0.5 km S of Hwy 16 crossing, Arroyo Garambullos, 28°34'N, 109°33'W, cliff face in riparian tropical deciduous forest with *Merremia palmeri*, 200 m, 14 Aug 1998, *Fishbein 3573!*; Arroyo Los Garambullos, 21 Aug 2000, *Reina-G. 2000-473!*; Río Yaqui bridge on MEX 16, just S of Tónichi, 200 m, 21 Sep 1997, *Reina-G. 97-968!* **CHIHUAHUA. Mpio Maguarichi:** Guasaremos, oak slope, flowers white, 5 Aug 1935, *Gentry 1558!*

***Ipomoea seaania*** Felger & D.F. Austin, *Sida* 21:1296. 2005. TYPE: MEXICO. SONORA: Municipio Guaymas. Broad canyon, ca. 1 km north of Bahía San Carlos on old road to Bahía Algodones, 27 Feb 1985, *Felger & Devine 85-301* (HOLOTYPE: ARIZ!; ISOTYPES: MEXU!, MO!, NY! See label information below).

Openly-branched **shrubs** 1–4 m. tall, with multiple woody stems from the base, the upper twigs sometimes sinuous or moderately spiraling, sometimes becoming extremely slender. Herbage largely glabrous or glabrate except newest growth densely to sparsely short-pilose, the trichomes mostly spreading. **Leaves** drought deciduous, lanceolate to ovate, long shoot leaves often 2–8 cm long, 1.5–2 cm wide, the blades lanceolate to ovate, with 6–8(–10) lateral pairs of primary veins, the base obtuse to subtruncate, the apex obtuse to emarginate, the midrib often ending in a short mucrone, glabrous; petioles 8–15(–20) mm long, with a pair of glands, usually conspicuous, at the junction of petiole and blade, seen on the lower leaf surface. Spur branch leaves often 4–8 cm long, to 4–11 mm wide, linear to linear lanceolate with 6–10 lateral pairs of primary veins, the base obtuse to subtruncate, the apex obtuse or blunt, or sometimes shallowly emarginate, the midrib often ending in a

short mucrone; petioles to 2–9(–13.5) mm long. **Inflorescences** of 1 or 2 (3) flowers, appearing solitary but cymose on short-shoots 2–5 mm long, these sometimes with a few small leaves; bracts 5–8 mm long, quickly deciduous, broadly oblong with an obtuse tip; peduncles very short, to 5 mm long, the pedicels 8–22 mm long. **Sepals** 12–17 mm long, 6–8 mm wide, broadly lanceolate to mostly ovate, puberulous to villous, the inner surfaces generally more densely hairy than the outer surfaces, the trichomes white, appressed to mostly ascending, and curly to straight. Inner (adaxial) sepals obtuse, the surfaces with trichomes 0.15–0.6 mm long; outer (abaxial) 2 sepals acute, slightly narrower and more sparsely pubescent than the inner 3, the trichomes 0.1–0.5 mm long, the sepal margins scarious and glabrous or glabrate. **Corollas** 4–6 cm long and 7–8 cm wide, showy, funnellform, glabrous, white with yellowish interplacae and a maroon band at inside base of the tube. Stamens 5, with 4 filaments 25–26 mm. long, the fifth stamen 23–24 mm long, filaments pubescent on the basal 4 mm; anthers 6–7 mm, long oblong, sagittate; pollen spheroidal, spinulose. Ovary 3 mm long, glabrous; style 37–38 mm long, glabrous; stigma 2-globose.

*Sonora*.—Near the southern margin of the Sonoran desert where it is endemic to hills and mountains west of Bahía San Carlos, generally on rocky ridges, steep colluvium and rhyolite slopes of canyon sides and cliff base; near sea level–100 m. Although locally common, the San Carlos population is threatened by tourist development (Felger 1999). There are no other records for this unusual shrub. Flowering January–April.

**Mpio Guaymas:** Road outside Bahía San Carlos, 10 m, cliff base in hardened volcanic soil, NW slope, with *Euphorbia ceroderma*, *Mascagnia macroptera*, *Acacia willardiana*, open shrub, 1–1.5 m tall, 21 Feb 1977, Ames 77-60 (paratype!); Between San Carlos Bay and Catch-22 airstrip, near sea level, 5 Jan 1983, Daniel 2360!; Road between San Carlos Bay and Catch-22 airstrip, 8 Mar 1985, Daniel 3986 (CAS!); Canyon, ca. 4 km N of Bahía San Carlos, steep rocky canyon with dense desertscrub, shrub 1.8 m tall, scattered, not common, 6 Sep 1980, Felger 80-36 (paratype!); Broad canyon, ca. 1 km N of Bahía San Carlos on old road to Bahía Algodones, 27.958889°N, 111.0625°W, 15 m, rhyolitic hillside, ca. 5 m above canyon bottom with riparian vegetation, dense desertscrub with ca. 60% cover of perennials: [38 associated species of perennials listed on the herbarium label]; shrub 2–3 m tall, in full flower, corollas white, locally common on steep rock hillsides, 27 Feb 1985, Felger 85-301 (isotype!); 0.1 mi N of N end of San Carlos Bay, W-facing slopes above bay, 15 m, Sonoran desertscrub, shrub 2–3 m tall, 10 Oct 1985, Felger 85-1232 (paratype!); San Carlos Bay, a canyon one mile N of the bay near Cerro Los Algodones, along the road to Rancho La Manga, 27.97°N, 111.07°W, 90 m, rocky volcanic ridge and adjacent stony canyon bottom: *Bursera*, *Prosopis*, *Jatropha*, *Croton sonorae*, *Acacia willardiana*, etc, scarce large shrub about 12 feet high with many stems from base, on floor of canyon above wash, flowers white with yellowish star pattern and maroon band in throat, 22 Mar 1983, Sanders 3616! (paratypes, ARIZ!, TEX!, UCR!).

***Ipomoea sescossiana*** Baill., Bull. Mens. Soc. Linn. Par. 1:385. 1883. TYPE: MEXICO. SAN LUIS POTOSI: Sescosse s.n. (HOLOTYPE: P, not seen; ISOTYPE: US! ex herb. P).

*Ipomoea pringlei* A. Gray, Proc. Amer. Acad. Arts 22:307. 1887. TYPE: MEXICO. CHIHUAHUA: foot-hills of the Santa Eulalia and Mapula Mountains, 7 Sep 1886, Pringle 782 (HOLOTYPE: GH!; ISOTYPES: BR!, GOET!, K!, LL!, MA!, MO!, NY!, PI!, PH!, RSA!, TEX!, US!).

#### ROMERIA DE LA SIERRA

Perennial erect **herbs**, with tuberous roots, the stems shrubby, spreading, glabrous. **Leaves** 2–4 cm long, 0.5–1.5 cm wide, orbicular in outline, irregularly pinnately divided into 5–9 obtuse-tipped divisions, the lobes linear to filiform, entire or rarely toothed, glabrous; petioles 3–15 mm long. **Inflorescences** mostly of solitary flowers, at times 2 or 3 flowers. **Flowers** on peduncles 0.8–3.5(–8) cm long, the pedicels 0.6–1.5 cm long, accrescent and erect in fruit; bracts 2–3 mm long, lanceolate. Sepals 6–11(–13) mm long, 3–6(–8) mm wide, subequal, oblong-ovate, smooth, obtuse-rounded to emarginate or cuspidate, the margins scarious. Corollas 6–10 cm long, funnellform, rose-purple to purple, the tube whitish, glabrous, the limb 6–8 cm wide. **Capsules** 14–16 mm long, 10–14 mm wide, ovoid to almost globose. Seeds 1–4, 8–9 mm long, compressed ovoid, black, finely appressed tomentose.

Although not documented for Sonora, it occurs in Chihuahua near high elevations in east-central Sonora and is likely to turn up in the highlands of easternmost Sonora.

**General distribution.**—Chihuahua, Coahuila, Durango, San Luis Potosí, Zacatecas; 1000–2400 m. Flowering June–October.

This species is an erect herb with bee-flowers. This xenogamous species is sister to *I. ancisa* and *I. stans* (McDonald 2001; Ana Rita Simões, pers. comm. 23 Nov 2011).

**CHIHUAHUA. Mpio Moris:** La Cieneguita, Río Mayo Upper Sonoran, 10 Sep 36, Gentry 2648! [ca. 35 km E of Sonora]; **Mpio Madera:**

Chuichupa, Aug 1936, *Harde LeSueur* 850! [ca. 25 km E of Sonora]. **Mpio Temosachi**: NW of Yepómera on hwy 180, 2100 m, flowers mostly white, 31 Aug 1989, *Mayfield* 274! [84 km E of Sonora]; 1 mi beyond Madera junction 5 mi N of Yepómera, Río Yaqui region, 5500 ft, flower pale lavender, shrub, *Jenkins, Martin, & Moore* 21 Jul 1986!

***Ipomoea tenuiloba*** Torr., Rep. U.S. Mex. Bound., Bot. 148–149. 1859. TYPE: U.S.A. TEXAS: hills and rocky places near Puerto de Paysano, Sep, *Bigelow et al.* (HOLOTYPE: NY!; ISOTYPE: US!).

*Ipomoea lemmoni* A. Gray, Proc. Amer. Acad. Arts 19:20. 1883. TYPE: U.S.A. Arizona [Cochise Co.] Near Fort Huachuca, cienega, Tanner's C[anon?] [Garden Canyon, Huachuca Mountains,] 1882, *Lemmon* 2840 (HOLOTYPE: GH!, ISOTYPES: P!, US!). *Ipomoea tenuiloba* Torr. var. *lemmoni* (A. Gray) Yatsk. & C.T. Mason, Madroño 31:102. 1984.

*Ipomoea leptosiphon* S. Watson, Proc. Amer. Acad. Arts 23:280. 1888. TYPE: MEXICO. CHIHUAHUA: foothills of Sierra Madre, 1 Sep 1887, *Pringle* 1337 (HOLOTYPE: GH!, photo F!; ISOTYPES: F!, K!, NY!, PH!, TEX!, US!).

Perennial **herbs**, with tuberous roots, the stems prostrate but twining near the tips, glabrous. **Leaves** 1–7 cm long, 3–10 cm wide, orbicular in outline, pedately 5–9 lobed, the lobes linear to lanceolate, 0.5–6.5 mm wide, entire, glabrous; petioles 2–38 mm long. **Inflorescences** mostly of solitary flowers. **Flowers** on peduncles 1–39 mm long, sessile or the pedicels to 8 mm long, recurved in fruit; bracts 1–3 mm long, linear to deltoid-attenuate. Sepals unequal; outer sepals 5–11.5 mm long, 2–3 mm wide, oblong-lanceolate, muricate along the midrib or almost smooth, the margins scarious, mucronate; inner sepals 8–9 mm long, 3–4 mm wide, obovate-acuminate, smooth, the margins scarious, glabrous. Corollas 4.5–10 cm long, funnellform or salverform, completely white or white with pale rose to purple limb, glabrous, the limb 3–3.6 cm wide. **Capsules** 4–8 mm wide, ± globose to broadly ovoid, with an apiculum 4–5 mm long. Seeds 1–4, 3.5–5 mm long, ovoid, black to dark brown, finely appressed tomentose. This delicate twiner has moth flowers that McDonald (2011) considered xenogamous.

**Sonora**.—Documented in Sonora with four specimens from mountains in the eastern part of the state, in hills and rocky sites, oak woodland and pine-oak forest; ca. 1280–1950 m. Flowering August–September.

**General distribution**.—Arizona, New Mexico, Texas; Chihuahua.

Two varieties are recognizable: Variety *tenuiloba* with 5–7 leaf divisions to 1.2 mm wide, a mostly white salverform corolla 6.5–10 cm long and the free portions of the filaments 8–11 mm long. Variety *lemmoni* (A. Gray) Yatsk. & Mason with 7–9 leaf divisions to 6.5 mm wide, a funnellform corolla 3.5–6.5 cm long, with a white tube and rose to purple limb and the free portion of the filaments 14–19 mm long. In some areas these varieties intergrade, and a specimen from northeast Sonora (*White* 3474) was considered an intermediate by Yatskievych and Mason (1984). The species is nocturnal and those studied in southern Arizona opened about 1:00 a.m. and often closed before dawn (Austin 1991).

**Mpio Álamos**: Sahuaribo and vicinity, 27°19'N, 108°34'W, 1550 m, *Martin* 23 Aug 1992! **Mpio Bavispe**: Sierra el Tigre, Las Tierritas de El Temblor, pine zone, 18–24 Aug 1940, *White* 3474! **Mpio Yécora**: 16.7 km NE of Yécora on Mex 16, grassland on rocky slope in oak woodland, 28.38°N, 108.8258°W, 1410 m, very common herbaceous perennial in dense herbs, flowers lavender with white throat, drying magenta, open at 9:30 a.m., 2 Sep 2000, *Van Devender* 2000-640 (USON!); Yécora, 28.3636°N, 108.9228°W, 1540 m, grassland, locally common prostrate vine among bunch grasses, flowers white, open at 7:00 a.m., 5 Sep 2001, *Van Devender* 2001-844!

***Ipomoea ternifolia*** Cav. var. ***leptotoma*** (Torr.) J.A. McDonald, Harvard Pap. Bot. 1:120. 1995. TYPE: MEXICO. SONORA: near Santa Cruz Valley. Sep 1851, *Thurber* 977 (LECTOTYPE: GH!; ISOLECTOTYPE: NY!); 1851–52, *Wright* 1614 (SYNTYPE: NY!; MO!; K!, mounted with *Palmer* 231). *Ipomoea leptotoma* Torr., Rep. U.S., Mex. Bound., Bot. 2(1):150. 1859. House (1908: 235) wrote that the *Thurber* 977 specimen at GH was the “type.” We consider all this as evidence that House effectively selected the *Thurber* 977 specimen as the lectotype and that McDonald's (1995) selection of *Wright* 1614 as the lectotype was superfluous.

*Ipomoea divergens* House, Muhlenbergia 3:40. 1907. TYPE: MEXICO. SONORA: Guaymas, 1887, *Palmer* 231 (HOLOTYPE: US!, ISOTYPES: K!, GH!).

*Ipomoea leptotoma* var. *wootoni* Kelso, Rhodora 39:151. 1937. TYPE: U.S.A. ARIZONA: Santa Rita Mountains, 10 Sep 1914, *Wooton* (HOLOTYPE: US!).

Annual **herbs**, with a fibrous root system; stems slender and procumbent, twining at tips, glabrous. **Leaves** with blades pedately 5 or 7 parted, 1.5–3 cm long and wide, basally cordate, the segments linear, apically acute, glabrous to remotely setose; petioles to 2 cm long. **Inflorescences** of solitary flowers or cymose. **Flowers** 1 or 2, the peduncles slender, equaling or exceeding the leaves, the pedicels (10–)15–18(–20) mm long, erect in

fruit; bracteoles 2–2.5 mm long, subulate. Sepals unequal; outer sepals 8–9 mm long, 2–3 mm wide, lanceolate; inner sepals 10–11 mm long, 3–4 mm wide, attenuate-acuminate, glabrous or hirsute at least on the three main veins and along the margins, otherwise membranaceous. Corollas 2.5–3.2 cm long, funnellform, purple (occasionally white), glabrous, the limb 3.2–4.6 cm wide. **Capsules** 3–5 mm wide, ellipsoid to ovoid depending on the number of seeds, with an apiculum 5 mm long or longer. Seeds 1–4, 5–6 mm long, ovoid, black and gray mottled, minutely appressed tomentose.

*Sonora*.—Statewide except the northwest; Sonoran and Chihuahuan deserts, foothills thornscrub, tropical deciduous forest, mesquite-grassland, and oak woodland; near sea level–ca. 2000 m. Flowering January and June–November.

*General distribution*.—The species, with 3 allopatric varieties, is widespread in deserts and tropical deciduous forests of southwestern United States to El Salvador. Variety *leptotoma*, the northernmost one, occurs in southeastern Arizona, southwestern Chihuahua, and most of Sonora and Sinaloa, and Baja California Sur. This species is self-incompatible and bee pollinated (McDonald 1995; McDonald et al. 2011).

*Selected reference*.—McDonald (1995).

**Mpio Agua Prieta**: Colonia Morelos, 2600 ft, 5 Oct 1941, *White 4619!* **Mpio Álamos**: Álamos, 16 Oct 1936, *Gentry 2928!*; 3.7 km N of Güirocoba, 450 m, abundant annual in field, flowers white, 23 Sep 1994, *Van Devender 94-759!*; El Guayabo (upper) crossing of the Rio Cuchujaqui 3 km NE of Sabinito Sur and 15 km (airline) ESE of Álamos, near 27°00'N, 108°47'W, 350 m, tropical deciduous forest, 12 Oct 1992, *Sanders 12891* (UCR!). **Mpio Babiácora**: 5 km W-SW of Mazocahui on SON 89, 29°31'31"32N, 110°08'07"W, 635 m, occasional annual vine with white flowers among abundant purple-flowered plants on disturbed roadside, flowers open 3:45 p.m., foothills thornscrub, 16 Sep 2000, *Reina-G. 2000-714!*, 2000-715! **Mpio Benjamin Hill**: 5 mi S of Benjamín Hill, 740 m, 8 Oct 1985, *Felger 85-1066!* **Mpio Cananea**: S side Sierra Mariquita, ca. 10 km NW of Cananea, ca. 2000 m, 1 Sep 1996, *Shortman 96-11!* **Mpio Carbó**: Hermosillo-Nogales road W of Carbo, 2 Sep 1934, *Shreve 6794!*; Rancho el Carrizo, 2400 ft, *Tomelson 7 Aug 1968!*; 2 km S of Los Chinos, 23 km N of El Oasis, foothills thornscrub, 665 m, flowers lavender, drying magenta, open 2:00 p.m., 6 Jan 2001, *Van Devender 2001-14!* **Mpio La Colorada**: 3 mi E of La Colorada, 1300 ft, 12 Jan 1981, *Fischer 6869!*; 4 km W of Cobachi (dirt road between paved roads to Tecoripa and Mazatan, *Van Devender 23 Nov 1978!* **Mpio Cucurpe**: Rancho Agua Fria, flowers white, *Van Devender 6 Sep 1976!*; 4 mi SW of Agua Fria, 30°19'N, 110°36'W, *Martin 3 Sep 1983!* **Mpio Cumpas**: 5 km ESE of Jécori, road to Moctezuma, 26 Oct 1984, *Felger 84-380!* **Mpio Fronteras**: 2.6 mi road S of Esqueda, mesquital, nocturnal purple flowers, 4200 ft, 7 Sep 1960, *Felger 4048!* **Mpio Guaymas**: Arroyo Las Pirinolas, road from Rancho San Antonio to Rancho San José de Robinson, 28.1112°N, 111.036667°W, 100 m, *Felger 01-742!* **Mpio Hermosillo**: La Puerca, 4 mi SW, between Hermosillo and Tastiota, along an arroyo, 4 Sep 1941, *Wiggins & Rollins 280!*; 1 km W of Los Horcones, 10 km W of San José de Pimas on MEX 16, 28.7431°N, 110.4197°W, 400 m, locally common albino-flowered (white fading to lavender) individuals, abundant purple-flowered annuals, roadside, Sonoran deserscrub, 9 Sep 1999, *Reina-G. 99-382A!* **Mpio Huatabampo**: 9 km SW of Melchor Ocampo, 40 m, common annual vine on shrubs, flowers purple, *Friedman 409-94* (ASU!). **Mpio Ímuris**: Agua Caliente, 19 km N of Ímuris on Mex 15, cottonwood-willow forest in ciénega, 980 m, flowers lavender with white tube, open 10:40 a.m., 4 Sep 2000, *Van Devender 2000-671!* **Mpio Moctezuma**: Moctezuma, 29.799°N, 109.677°W, 620 m, flowers lavender-pink with white throat, open 8:00 am, 14 Aug 2006, *Reina-G. 2006-468!* **Mpio Navojoa**: Summit of Mesa Masiaca microwave tower 6.5 km (by air) W-NW of San Jose de Masiaca, 26.78170°N, 109.295°W, 200 m, 19 Jan 1995, *Friedman 154-95* (ASU!); 2 km N of Teachive, SW end of Cerro Terúcuchi, foothills thornscrub, 26°48.1'N, 109°14.4'W, 100 m, 28 Sep 1996, *Reina-G. 96-582!* **Mpio Opodepe**: 5.6 mi on Méx Hwy 15 S of Benjamín Hill, 30.067°N, 111.083°W, 8 Oct 1985, *Felger 85-1066!* **Mpio Pitiquito**: 20 mi S of Pitiquito, 23 Oct 1932, *Shreve 6025!* **Mpio Soyopa**: El Novillo, 350 m, 24 Oct 1984, *Felger 84-247!*; Tónichi, hills above river, *Spicer 9 Sep 1941!*; Just S of Tónichi, 200 m, flowers purple, 21 Sep 1997, *Reina 97-966!*; 1.5 km S of Tónichi, 180 m, flowers lavender, open midday, 7 Jan 2001, *Reina 2001-28!* **Mpio Santa Cruz**: Rancho Los Fresnos, reserve in upper San Pedro River drainage, along US-Mexico border, 31.3206°N, 110.367°W, 1555 m, grassland with isolated patches of oak-mesquite woodland, corolla pink, 22 Sep 2006, *Boyle 7895!* **Mpio Trincheras**: Trincheras, 30°23'38"N, 110°31'43"W, *Meling 1 Oct 1986* (USON!). **Mpio Ures**: Ures, 29°25'30"N, 110°23'21"W, *Meling 19 Sep 1986* (USON!).

***Ipomoea thurberi*** A. Gray, *Syn. Fl. N. Amer.* 2:212. 1878. TYPE: U.S.A. ARIZONA: *Thurber 966* (HOLOTYPE: GH!).

*Ipomoea gentryi* Standl., *Field Mus. Nat. Hist.* 22:46. 1940. TYPE: MEXICO. CHIHUAHUA: *Gentry 2497* (HOLOTYPE: F!; ISOTYPE: MO!).

Glabrous perennial twining **herbs**, from an elongate, tuberous root, the stems trailing. **Leaves** with blades 1–5 cm long, 2–6.5 cm wide, sagittate to pedately 5 or 7 lobed, the lobes divergent, lanceolate, linear to oblong, basally sagittate, sparsely strigose; petioles 0.9–2 cm long. **Inflorescences** solitary. **Flowers** on peduncles 3–4 mm long, the pedicels 7–8 mm long, erect in fruit; bracts ca. 1 mm long, scale-like. Sepals 12–15 mm long, 3–4 mm wide, ± equal, lanceolate, acuminate apically, smooth, setaceous-caudate, obscurely warty at base or not. Corollas 5–8 cm long, funnellform-salverform, white with a rose limb and green tube (drying purple), opening

in the evening, glabrous, the limb 5–6.5 cm wide. **Capsules** 6–7 mm wide,  $\pm$  globose to ovoid, with an apiculum 4–5 mm long. Seeds 3–6, 3.5–4 mm long, ovoid, black to dark brown, finely tomentose.

**Sonora.**—Mountains of eastern Sonora in grassland, oak woodland, and pine-oak forest; at least 1150–1600 m. Flowering July–September. The flowers open at dusk when they are visited by hawkmoths, perhaps *Hyles lineata* and probably others. Also near the Sonora border in Cochise and Santa Cruz Counties in Arizona but not common.

**General distribution.**—South-central and southeastern Arizona; Chihuahua, Durango, apparently disjunct to Distrito Federal, Chiapas; Guatemala, Nicaragua.

**Mpio Álamos:** 1 mi E of Saguariño, 1575 m, 23 Aug 1993, *Fishbein 1345!*; Rancho Santa Bárbara, 27°07'N, 108°43'W, 1200 m, *Smith & Rascon 18 Jul 1990!* **Mpio Bavispe:** Cañón de la Palomita, grassland, N of El Tigre, 3700 ft, 28 May 1941, *White 4159!* **Mpio Cananea:** Sierra de los Ajos, Hwy 89, 6.8 mi S of Arroyo Los Ajos, 30°51½'N, 110°04½'W, 1325 m, 26 Jul 1993, *Fishbein 1231!* **Mpio Nogales:** 10 km NW of Rancho El Diamante (on road to Saric from Mex 15), dense ocotillo scrub, 31°12'10"N, 111°50'12"W, 1176 m, rare, 17 Aug 2004, *Van Devender 2004-898!* **Mpio San Felipe de Jesús:** Vicinity El Llano, 9.5 mi W of San Felipe, Sierra de los Locos, *Hole & Martin 11-12 Aug 1980!* **Mpio Santa Cruz:** 3.5 km E of Nogales on road to Santa Cruz, 31.3167°N, 110.8817°W, 1215 m, common perennial vine on rocky, grassy slope, buds pale pink in late afternoon, grassland/oak woodland, 15 Aug 2001, *Reina-G. 2001-645!* **Mpio Sahuaripa:** Mesa Encinosa, 32.8 km (by air) NNE of Sahuaripa, Northern Jaguar Reserve, 29.3328°N, 109.1297°W, 1188 m, rocky mesa and slopes, open oak woodland, 7 Sep 2009, *Van Devender 2009-1052!* **Mpio Yécora:** Yécora, 1540 m, 7 Sep 1995, common annual in dense herbs, flower light pink, open mid-afternoon, *Van Devender 95-849!*; 4.7 km N of Yécora on road to Agua Blanca, 28°24'44"N, 108°55'29"W, 1570 m, 15 Jul 1997, *Reina-G. 97-7117 (FTG-FAU!)*; Arroyo Hondo, 4 km W of Chihuahua border, pine-oak forest, flowers light pink, late afternoon, 6 Aug 2000, *Reina-G 2000-365A!*; 2 km NW of Yécora on old road to Santa Rosa, 28°22'45"N, 108°50'45"W, 1560 m, 5 Sep 1996, *Wiens 96-122!*; NW of the cemetery in Yécora, 28°22'40"N, 108°56'W, 1540 m, *Traub 2 Sep 1997 (FTG-FAU!)*.

***Ipomoea triloba* L., Sp. Pl. 161. 1753.** TYPE: based on *Convolvulus pentaphyllos minor, flore purpureo* in Sloane, *Voy. Jamaica* 1:153, t. 97, f. 1, 1707 (LECTOTYPE!).

**Herbs,** annual, the stems prostrate and twining, 1–3 m long, glabrous or occasionally sparsely pubescent, the indument concentrated on the nodes. **Leaves** 2–8 cm long, 2–7 cm wide, broadly ovate to orbicular, entire, coarsely dentate to deeply 3–7-lobed, basally cordate, the basal lobes rounded to angular or lobed, apically acute to obtuse, both surfaces glabrous or sparsely pilose. **Inflorescences** axillary, cymose. **Flowers** 1–3(–12) with peduncles variable in length from shorter to longer than the petioles, glabrous, angular, minutely verruculose at least toward the apex. Sepals 6–7 mm long,  $\pm$  equal, the outer sepals oblong to narrowly elliptic-oblong, obtuse to acute, mucronulate-caudate, glabrous or sparsely pubescent without, conspicuously ciliate, mostly glabrous otherwise. Corollas 1–2 cm long, funnelform, lavender, glabrous. **Capsules** 5–6 mm wide,  $\pm$  globose, brown, bristly pubescent. Seeds 1–4, 2.5–3.2 mm long, globose, dark brown, glabrous.  $2n = 30, 60$ .

**Sonora.**—A weed carried, at least partly, as a contaminant in rice and others seeds. Sonoran desert, coastal thornscrub and tropical deciduous forest, often in disturbed sites; 0–950 m. Flowering all year.

**General distribution.**—California; Campeche, Chiapas, Guerrero, Jalisco, Edo. México, Nayarit, Nuevo León, Oaxaca, Sinaloa, Tabasco, Tamaulipas, Veracruz, Yucatan; Mesoamerica; Argentina, Bolivia, Brasil, Colombia, Ecuador, Paraguay, Peru, Venezuela; Caribbean.

**Mpio Álamos:** Algodones, 8 Sep 1935, *Gentry 1681!* (mixed with *I. parasitica*); Rancho Esmeralda, N edge of Álamos, 27°00'02"N, 108°56'45"W, 380 m, 21 Nov 1993, *Van Devender 92-895!*; El Ranchería crossing of Río Cuchujaqui, 22.5 km S of Álamos on road to El Chínal, 26°51'N, 108°55'W, 200 m, flowers pink, 10 Oct 1992, *Van Devender 92-1146!* **Mpio Etchojoa:** 2 mi E of Bacobampo, 30 m, weedy roadside ditch, flowers purple, 17 Dec 1988, *Sanders 8955!* **Mpio Granados:** Granados, 29.8236°N, 109.2986°W, 550 m, *Meling 23 Sep 1986 (USON!)*. **Mpio Guaymas:** 1.7 mi on Mex 15 NW of junction of road to Pitahaya, 27°47'N, 110°26'W, 10 m, coastal plain of thornscrub, marshy, climbing over highway culvert, corollas lavender pink, 11 Oct 1985, *Felger 85-1296!*; 1.3 mi S of Mex 15 on road to Las Guásimas, 27°53'N, 110°34'W, 8 m elev, in shrubs and trees along drainageway, calyx smooth, corollas pink with magenta center, rare, 9 Oct 1985, *Felger 85-1160!* **Mpio Hermosillo:** Km 5, Calle 36, Costa de Hermosillo, Lopez 5 Oct 1984 (USON!). **Mpio Huatabampo:** 9.5 km S on MEX 15 from Las Bocas, 18 Jan 1995, *Friedman 72a-95!*; Bachoco, arroyo 1 km NE of town, 26°44'N, 109°21'W, *Martin & O'Rourke 27 Dec 1986!* **Mpio Navojoa:** 1.5 mi SW of Margarita, 8 km NW of Navojoa, 27°08'N, 109°30'30"W, coastal plain, *Martin & O'Rourke 28 Dec 1985!* **Mpio Ónavas:** La Mula, 28°28'50"N, 109°22'38"W, 790 m, tropical deciduous forest, flowers lavender, drying magenta, opening 7:00–8:00 pm, 30 Aug 2000, *Van Devender 2000-511!* **Mpio San Javier:** Cañón Lo de Campa, 28°32'N, 109°44'33"W, 480 m, 29 Sep 1996, *Varela 96-368 (FTG-FAU!)*. **Mpio Soyopa:** Arroyo Los Garambullos, 0.5 km SE of Río Yaqui bridge on Mex. 16, 1.5 km E of Tónichi, 28.5694°N, 109.55°W, 180 m, common along river bank, flowers light to dark pink, open at 7:00–8:00 a.m., 29 Sep 2000, *Van Devender 2000-749 (USON!)*. **Mpio Yécora:** Santa Ana de Yécora, 28.3778°N, 109.15°W, 850 m, very common herbaceous vine, flowers pink, open in the morning, 20 Sep 1998, *Van*

*Devender* 98-1435 (USON!); Santa Ana, Bermúdez junction, *Martin* 10 Oct 1988!; Santa Ana de Yécora, 28°22'40"N, 109°09'W, 850 m, *Traub* 7 Aug 1997 (FTG-FAU!); 3 km N of Tepoca on MEX 16, 28°27'18"N, 109°15'38"W, 770 m, 10 Sep 1994, *Búrquez-M.* 94-145 (FTG-FAU!).

*Ipomoea wrightii*, see *I. heptaphylla*

**JACQUEMONTIA** Choisy, Mém. Soc. Phys. Genève 6:476. 1834. [Commemorates Victor Jacquemont, 1801–1832, French botanical explorer.]

**Vines**, herbs or suffrutescent **shrubs**; stems herbaceous toward tips, procumbent to twining (except sometimes in *J. agrestis*), perennials or occasionally annuals, glabrous or hairy. Leaves chartaceous to herbaceous, mostly cordate, glabrous or hairy usually with stellate trichomes, entire or variously repand, dentate, or lobate, petiolate. **Inflorescences** in scorpioid cymes, head-like cymes, umbelliform, or flowers solitary. **Flowers** on pedicels 5–30 mm long, the bracts small and linear or lanceolate or large and foliose. Sepals equal or unequal, variable in shape, hairy or glabrous. Corollas blue, lilac, or white (red in one West Indian species), subrotate, campanulate, or funnelform, deeply lobed, dentate or almost entire, glabrous or hairy. Stamens and styles included (in our species). Pollen 3-colpate, 12- or 15-rugate. Ovary 2-locular, 4-ovulate, glabrous or hairy; styles 1, filiform; 2 stigmas ellipsoid or oblong and flattened. **Fruits** capsular, 2-celled, with 4 or 8 valves, globose to subglobose. Seeds 1–4, glabrous or pilose, or tuberculate, or winged.

About 80–100 species in the Americas and several in Australia.

*Selected references.*—Austin (2006), Robertson (1971).

- |  |       |                       |
|--|-------|-----------------------|
| 1. Sepals with truncate or cordate bases   | _____ | <b>J. pringlei</b>    |
| 1. Sepals with rounded to narrowed bases.  |       |                       |
| 2. Annuals with simple glandular and/or stellate hairs. Outer sepals ovate, narrowly ovate to lanceolate | _____ | <b>J. agrestis</b>    |
| 2. Perennials; hairy or glabrous or nearly so, not glandular. Outer sepals ovate to broadly ovate.       |       |                       |
| 3. Outer sepals with long attenuate apices   | _____ | <b>J. abutiloides</b> |
| 3. Outer sepals apices obtuse, mucronate, acute or acuminate   | _____ | <b>J. polyantha</b>   |

**Jacquemontia abutiloides** Benth., Bot. Voy. Sulphur 34–35. 1844. TYPE: MEXICO. BAJA CALIFORNIA [SUR]: Bay of Magdalena, *Hinds s.n.* (HOLOTYPE: K!; photo MO!).

Scrambling and twining **perennial vines**, the stems generally woody near the base and slender above growing into and overtopping shrubs reaching 2 (3) m long; younger stems and herbage with 3-branched stellate hairs, mostly crowded but varying from densely overlapping to sometimes moderately dispersed when vigorously growing following ample rain, the hairs nearly white when young and golden-brown with age. **Leaves** ovate to broadly ovate, to 8 cm long and 4.5 cm wide, usually  $\frac{1}{2}$  to  $\frac{2}{3}$  that size, apically obtuse, acute or rarely retuse, mucronate, acuminate or cuspidate, basally cordate with a deep and wide sinus, pubescent; petiolate. **Inflorescences** axillary, cymose, rarely solitary, the dichasia 1–2 times compound, the peduncles 2.5–8(–13.5) cm long. **Flowers** on pedicels 1–6 mm long, the bracts linear, to 12 mm long. Sepals of different sizes, the outer 2 ovate to narrowly ovate with attenuate apices, 7–11 mm long, 3–6 mm wide, the middle sepal narrowly ovate, attenuate apically, sometimes slightly falcate, the inner 2 sepals ovate or broadly ovate, 5–7 mm long, 2.5–3 mm wide, apically attenuate, the bases narrowed with a stipe ca. 1 mm long; all 5 sepals pubescent on the outer surfaces and to a lesser extent on the inner surfaces, enlarging slightly in fruit. Corollas (1.8–) 2–3.5 cm broad when open, broadly campanulate to rotate, blue. Stamens  $\pm$  equal or unequal, the anthers 1.5–2.5 mm long. Ovary ovoid, 1.5–2 mm long, the styles 6–7 mm long, longer than the stamens. **Capsules** 5–6 mm long, broadly ovoid, usually opening by 8 segments, partly enclosed by sepals. Seeds 1–4, 2.7–3.5 mm long, 1.8–2.5 mm wide, trigonous, minutely areolate and ruminant.

**Sonoran region.**—Sonoran desert on Isla Tiburón from near sea level—at least 490 m; widespread in the larger mountain mass (Sierra Kunkaak) and its eastern bajada to the south shore of the island; especially along washes and canyons, and also on desert plains and rocky slopes (Felger et al. 2012). Flowering with sufficient soil moisture at various seasons, flowers recorded October–April. Not known from mainland Sonora, which seems unusual since seemingly similar habitat to that on the island occurs on the adjacent Sonora mainland where Felger et al. (2012) have searched for it.

*General distribution.*—Endemic to the Sonoran desert in central Baja California (norte) to the Cape Region in Baja California Sur and adjacent islands, and Isla Tiburón.

*Jacquemontia abutiloides* is closely related to *J. eastwoodiana* and questionably distinct. For example, they have been considered as *J. abutiloides* var. *abutiloides* and *J. abutiloides* var. *eastwoodiana* (I.M. Johnst.) Wiggins. However, Robertson (1971) pointed out that *J. abutiloides* has 3-armed trichomes, peduncles which greatly exceed the leaves, dichasia with several blue flowers, outer sepals with attenuate apices and narrowed bases, and seeds which are usually wingless. By contrast, *J. eastwoodiana* has 4–7-armed trichomes, shorter peduncles, fewer (only 1–3) flowers, less acute sepals, and seeds which are sometimes winged on the outer two margins. *J. eastwoodiana* is endemic to the Baja California Peninsula and adjacent Gulf of California islands. Furthermore, *J. abutiloides* seems closely related to *J. pentanthos* and they can be difficult to distinguish, at least in northwest Mexico, except by their allopatric distributions (*J. pentanthos* is not known from Sonora).

**SONORAN ISLANDS. Tiburón:** Ensenada de la Cruz, 21 Oct 1963, Felger 9217!; Top of Sierra Kunkaak Segundo, 490 m, 25 Nov 2006, Wilder 06-487! (See Felger et al. 2012 for additional records).

***Jacquemontia agrestis* (Choisy) Meisn. in Mart., Fl. Bras. 7:306. 1869. TYPE: BRAZIL. BAHIA: Herbidis campis ad fl. S. Franc[isco], prope Joazeiro, Apr, Martius (M!). *Convolvulus agrestis* Choisy in DC, Prodr. 9:405. 1845.**

*Jacquemontia palmeri* S. Watson, Proc. Amer. Acad. Arts 24:63. 1889. TYPE: MEXICO: Guaymas, Jun 1887, Palmer 221 (HOLOTYPE: GH!; ISOTYPES: C!, K!, NY!, UC!, US!).

*Jacquemontia pauciflora* Brandegee, Univ. Calif. Publ. Bot. 4:384. 1913. TYPE: MEXICO. VERACRUZ: Purpus 6139 (HOLOTYPE: UC!; ISOTYPES: G!, MO!).

*Jacquemontia palmeri* var. *varians* Brandegee, Zoë 5:170. 1903. TYPE: MEXICO: BAJA CALIFORNIA SUR: Laderas S del Cabo, 1902, Brandegee s.n. (HOLOTYPE: UC!; ISOTYPE: US!)

Annual **herbs**, not vining or sometimes small, delicate vines, or rarely perennials, with simple glandular hairs and/or stellate trichomes. **Leaves** 1–6 cm long, 0.5–3.5 cm wide, broadly to narrowly ovate, basally cordate to subtruncate, apically acute to acuminate or rarely obtuse. **Inflorescences** monochasial, few-flowered. **Flowers** (1) 2–6 on peduncles 1–8 cm long, the pedicels 3–15 mm long, erect in fruit; bracts linear, inconspicuous. Sepals 3.5–6.5 mm long, subequal or the inner ones shorter, ovate, narrowly ovate or lanceolate, with long attenuate apices, and with only stellate trichomes or stellate and glandular indumentum. Corollas 6–12 mm long, subrotate to campanulate, blue, glabrous. Stamens 3.5–7 mm long, unequal, included; anthers 1 mm long. Ovary 1 mm long, subglobose, 2-locular, glabrous; styles 3–5.5 mm long. **Capsules** 4–5 mm. wide, subglobose. Seeds 1–4, 2–3 mm long, trigonous, semicircular in longitudinal section, minutely areolate and strongly verrucose, minutely winged on the outer 2 margins.

*Sonora.*—Sonoran desert, coastal and foothills thornscrub, and tropical deciduous forest, often in disturbed sites including cultivated fields and buffelgrass pasture; near sea level–1555 m. Flowering August–December.

*General distribution.*—Southern Arizona (Baboquivari and Las Guijas Mountains); Mexico, at least in Baja California Sur, Chiapas, Chihuahua, Durango, Guerrero, Jalisco, Michoacán, Nayarit, Sinaloa, and Veracruz, to Honduras; South America; Cuba.

Easily identified when glandular trichomes are present. Forms without glands are still distinctive from the others in Sonora by the usually annual habitat, few-flowered cymes, and lanceolate sepals.

**Mpio Álamos:** Parque El Chalatón, Álamos, NE side of the Sierra de Álamos, 27°00'40"N, 108°56'35"W, 500 m, 30 Sep 1992, Bertelsen 92-123!; Álamos, 28 Oct 1939, Gentry 4759!; [Choquincahui] 7 mi N of Güirocoba, Salmon 27 Dec 1988! **Mpio Benjamín Hill:** Rancho El Zorro, W of Rancho El Carrizo (16.9 km W of MEX 15 at 20.5 km S of Benjamín Hill), 30.0261°N, 111.2925°W, 771 m, 23 Aug 2007, Reina-G. 2007-932!; 11 m S of Noria, between Nogales and Hermosillo, twining among herbs, in shade along small wash, flowers deep blue, 26 Aug 1941, Wiggins & Rollins 76! **Mpio Carbó:** 14 mi by Tecolote road (1.2 mi N of El Oasis) W of MEX 15 in buffelgrass pasture, delicate annual, 750 m, 22 Aug 1982, Reichenbacher 1046! **Mpio Huatabampo:** Camahuiroa between Agiabampo and Las Bocas on the Gulf of California, 26°31'N, 109°16'W, 15 Mar 1993, Van Devender 93-305 (FTG-FAU!). **Mpio Moctezuma:** 21 mi S of Moctezuma, 2600 ft., 25 Sep 1934, Wiggins 7452 (GH!). **Mpio Ures:** Sierra de Mazatán, 26°6'11"N, 110°15'0"W, 860 m, selva baja cauducifolia, 10 Sep 2003, Sánchez-Escalante 03-91! **Mpio Santa Cruz:** Rancho los Fresnos, 1555 m, 5 Dec 2005, Stark I! **Mpio Yécora:** 4.3 km SE of Santa Ana de Yécora on road to Nuri, 745 m, 23 Sep 1977, Goldberg 77-186!; 1.9 mi W of Tepoca on Mex 15, tropical deciduous forest, occasional perennial vine, 10 Sep 1999, Reina-G. 99-439! **SONORAN ISLANDS:** Tiburón, SE side of Agua Dulce Valley, 28°57'20"N, 112°24.5'W, 280 m, 11 Dec 1976, Felger 76-T24!



*Jacquemontia albida*, see **J. polyantha**

**Jacquemontia pentanthos** (Jacq.) G. Don

This species has not been verified for Sonora. While it is common in eastern Mexico, it is either absent or rare in western Mexico. According to Robertson (1971), *J. pentanthos* is at the center of a group of species that includes *J. abutiloides*, *J. albida*, *J. eastwoodiana*, *J. polyantha*, *J. pringlei*, and five others. This group of taxa ranges from Arizona to Central America. We tentatively accept the distinctions made by Robertson (1971) in these segregates (except for *J. albida*), although the relationships of these taxa generally remains confused. These taxa are often misidentified or difficult to identify on herbarium specimens, while living plants are often considerably different. Within this alliance *J. polyantha* and *J. pentanthos* are closely related (see *J. polyantha*).

**Jacquemontia polyantha** (Schltdl. & Cham.) Hallier f., Bot. Jahrb. Syst. 16:543. 1893. TYPE: MEXICO. VERACRUZ: In dumetis ad Hacienda de la Laguna, 28 Sep 1828, Schiede & Deppe 220 (HOLOTYPE: HAL!; photos F!, MO!, NY!). *Convolvulus polyanthus* Schltdl. & Cham., Linnaea 5:117. 1830.

*Jacquemontia albida* Wiggins & Rollins, Contr. Dudley Herb. 3:277. 1943. TYPE: MEXICO. SONORA: [Mpio Hermosillo] Along an arroyo 1 mile NE of El Zapo, between Hermosillo and Tastiota, 4 Sep 1941, Wiggins & Rollins 273 (HOLOTYPE: DS at CAS!; ISOTYPES: ARIZ!, GH!, LL!, MICH!, MO!, NY!, RSA!, US!).

*Jacquemontia apiculata* House, Muhlenbergia 5:66. 1909. TYPE: MEXICO. TAMAULIPAS: vicinity of Victoria, about 320 m, 1 Feb–9 Apr 1907, Palmer 117 (HOLOTYPE: NY!, ISOTYPES: F!, GH, not seen, MO!, US!).

PANEYA (GUARIJIO, Gentry 1081)

**Perennial vines**, sparsely to densely pubescent with 3-armed trichomes. Stems twining to several meters long or procumbent, herbaceous or becoming woody near the base. **Leaves:** Blades 2.5–11.5 cm long, 1.5–6.5 cm wide, ovate, broadly ovate, to almost circular; basally cordate to less often truncate; apically highly variable—attenuate to acuminate, abruptly acuminate, obtuse or blunt, or sometimes mucronate; margins entire, or repand to undulate. Petioles 0.2–6.5 cm long. **Inflorescences** axillary, loosely cymose, of simple or often compound dichasia; peduncles 5–13 cm long and often longer than the leaves. **Flowers** on pedicels 0.5–2 cm long, the bracts linear, often 5–10 mm long. Sepals unequal to more or less equal; the outer two sepals 6–6.5 mm long, 3.5 mm wide, elliptic, broadly elliptic, or ovate to broadly ovate, the bases narrowed, the the apices acute or acuminate, or shortly attenuate; the inner sepals smaller (narrower and shorter), glabrous or sparsely to densely stellate. Corollas 1–2.5 cm long, funnelform to campanulate, white, glabrous. Stamens unequal, 5–12 mm long; anthers 1–2 mm long. Ovary 1.5 mm long, ovoid to cylindrical, glabrous; styles 6–11 mm long. **Capsules** 4–5 mm long, ovoid, partly enclosed by the sepals. Seeds 1–4, 2.7–3 mm long, rotund, brown, minutely areolate and verrucate-striate, glabrous.

**Sonora.**—From near Hermosillo and the east-central part of the state southward and eastward. Sonoran desert, coastal thornscrub, and tropical deciduous forest; near sea level–770 m. Flowering at least in January, March, September–December.

**General distribution.**—Widespread in Mexico including the Sierra Madre Occidental and Sierra Madre Oriental, and Sierra Madre del Sur, and at least in Chihuahua, Guerrero, Edo. México, Michoacán, Sinaloa, Tamaulipas, Veracruz; from desert margins to oak and pine-oak zones

Robertson (1971: 133) reported that *J. albida* is closely related to *J. polyantha*, “which has outer sepals that are broadly ovate or ovate and pubescent instead of elliptic and glabrous.” He knew *J. albida* only from the vicinity of Hermosillo. Many additional specimens available to us from a wide range indicate that differences between *J. albida* and *J. polyantha* are too few and do not distinguish them. As Robertson suspected, we conclude that they are best treated as a single species.

Robertson (1971: 168–169) also pointed out that, “Both *J. polyantha* and *J. pentanthos* are very closely related.” Primary differences between *J. polyantha* and *J. pentanthos* are in inflorescences, sepals, and flower color. *Jacquemontia pentanthos* has compact cymes and usually rhomboidal outer sepals with long attenuate apices; *J. polyantha* tends to have open cymes and elliptic to ovate outer sepals and acute or acuminate to short-attenuate apices. Moreover, *J. pentanthos* has blue flowers and those of *J. polyantha* are usually white.

**Mpio Álamos:** Canyon Sapopa, tropical Sonoran, vine on canyon slopes, wire, Mex., paneya, W [Guarijio], 19 Oct 1934, *Gentry 1081!*; Near Álamos, abandoned milpa, ground vine with short leafy branches and bright white flowers, 28 Oct 1939, *Gentry 4761* (ARIZ!, MO!); Near Taymuco, roadside, [flowers], *Martin 15 Mar 1992!*; Arroyo el Mentidero at Chinal road, 11.3 km S of Álamos, 26°54'45"N, 108°55'05"W, 240 m, canyon bottom in tropical deciduous forest, flowers white, 20 Sep 1993, *Meyer 11!*; Distrito Álamos, cañon Estrella, 10 Oct 1933, *Gentry 354!*; Chorihoa, tropical Sonoran, forest, pale bluish flowers, 22 Aug 1935, *Gentry 1596!*; Río Mayo Raft Trip, confluence of San Ignacio and Río Mayo, 27°55'N, 108°47'W, *Jenkins & Rondeau 26 Sep 1991!* **Mpio Cajeme:** 9 mi SE of Ciudad Obregón, dry level plain, columnar cacti and small thorny trees, corolla white, 12 Sep 1973, *Stevens & Fairhurst 2049* (DUKE!); Ciudad Obregón, valley arroyo, 29 Sep 1933, *Gentry 264!* **Mpio Guaymas:** 15 mi SE of Guaymas, arroyo, 26 Sep 1933, *Gentry 263* (F!). **Mpio Hermosillo:** 15 mi S of Hermosillo, mesquite bottomland, flowers white, 6 Sep 1939, *Gentry 4565!* **Mpio Huatabampo:** 1.5 km N-NW of Camahuira, coastal Sinaloan thornscrub, 26°33'25"N, 109°17'25"W, ca. 5 m, 23 Nov 1993, *Van Devender 93-1259!*; 2 km W of Tierra y Libertad on northern road to Camahuira, dense coastal Sinaloan thornscrub, 26°33'50"N, 109°12'50"W, flowers white, 24 Nov 1993, *Van Devender 93-1285!* **Mpio Sahuaripa:** 5 km W of Sahuaripa, carretera Sahuaripa-Bacanora, 29°01'30"N, 109°16'28"W, 720 m, bosque tropical caudicifolia, 28 Sep 1996, *Flores-M. 4780!* **Mpio Yécora:** 3 km N of Tepoca on MEX 16, 28°27'18"N, 109°15'38"W, 770 m, 10 Sep 1994, *Búrquez 94-147* (FTG-FAU!); Just S of Arroyo Palo Pinta bridge on Mex 16, tropical deciduous forest, 580 m, flowers white, 19 Sep 1998, *Reina-G. 98-1410!*

**Jacquemontia pringlei** A. Gray, Proc. Amer. Acad. Arts 17:228. 1882. TYPE: U.S.A. ARIZONA: Santa Catalina Mountains, 15 May 1881, *Pringle 295* (HOLOTYPE: GH!, photo MO!).

*Jacquemontia pringlei* var. *glabrescens* A. Gray, Amer. Acad. Arts 21:402. 1886. TYPE: MEXICO. CHIHUAHUA: near Batopiles, Aug–Nov 1885, *Palmer 107* (LECTOTYPE designated here by K.R. Robertson and D.F. Austin: GH!, photo MO!; ISOLECTOTYPES: K, not seen, (2) NY!, PH!); CHIHUAHUA: near Batopiles, Aug–Nov 1885, *Palmer 248* (SYNTYPE: GH!). ARIZONA. PIMA CO: Santa Catalina Mountains, 1882, *Lemon 3038 & 3038bis* (PARATYPES: GH!, K, not seen).

Perennial vines, the stems twining, with 4–6-armed stellate trichomes, rarely glabrate. Leaves broadly ovate to ovate, 2–6.5 cm long, 1.5–4.8 cm wide, basally shallowly cordate to truncate, apically acute or less often retuse to obtuse, sometimes mucronate. Inflorescences axillary, loosely cymose or solitary. Flowers 1–7 on peduncles 1–11 cm long, the pedicels 2–10 mm long, erect to nodding in fruit; bracts linear, to 6 mm long. Sepals subequal, the outer ovate to broadly ovate, the middle sepal falcate, the inner narrowly ovate, 5.5–9 mm long, the apices acute, pubescent without and to a lesser degree within. Corollas 1.4–2.7 cm long, funnellform, lavender to white, glabrous. Stamens 5–10 mm long, included, anthers 1.5–2 mm long. Ovary 1–1.5 mm long, ovoid, 2-locular, glabrous; styles 7–9 mm long. Capsules 5–6 mm long broadly ovoid, enclosed by accrescent sepals. Seeds 1–4, 2–2.5(–3) mm long, trigonous, brown, minutely areolate and ruminant.

**Sonora.**—Widespread except the northwestern corner of the state; Chihuahuan and Sonoran deserts, coastal and foothills thornscrub, and tropical deciduous forest. Near sea level–1000+ m. Flowering (March) August–December.

**General distribution.**—Pima, Yuma and Cochise Cos, Arizona; southwestern Chihuahua to northwestern Sinaloa.

**Mpio Álamos:** Río Mayo Raft Trip, confluence of Río Moris and Río Agua Caliente, 28°02.5'N, 108°29'W, *Rondeau & Jenkins 23 Sep 1991!*; Arroyo Verde, 27.1167°N, 108.7083°W, twining vine, flowers white, in shaded canyon, 1100 m, 15 May 1990, *Jenkins 90-58!*; Sierra Saguaribo, *Martin 20 Mar 1992!*; Sugar cane mill and ranch at Jurinabo along Río El Taymuco, 27°15.5'N, 108°46.4'W, 450 m, *Yetman 20 Mar 1992!*; El Guayabo crossing of Río Cuchujaqui, 2.6 km NE of Sabinito Sur, 14 km (by air) E-SE of Álamos, 27.0014°N, 108.7855°W, flowers white, 350 m, 5 Feb 1992, *Van Devender 92-244!*; 2.5 km (by air) N of Álamos, along road to Rincon Viejo, 27°03'25"N, 108°56'35"W, 420 m, common vine to 3 m on steep bank, flowers white, 20 Sept 1993, *Van Devender 93-856* (FTG-FAU!); Near Rancho La Junta at junction of Río Mayo and Arroyo Guajaray, 27.5917°N, 108.8917°W, heavily grazed pasture, vine on shrub, flowers white, 250 m, 18 Mar 1993, *Van Devender 93-400!* **Mpio Altar:** Base of Sierra El Humo, SSW of Sasabe, rocky cliff wall, 900 m, 2 Mar 2004, *Flesch 04-63!* **Mpio Cucurpe:** 6 mi NE of Cucurpe on road to Agua Fria (= R. Santo Domingo, = Saracachi), isolated Sinaloan thornscrub, on roadcut, scattered, flowers white with purplish tint, 2 Sep 1990, *Van Devender 90-481!* **Mpio Fronteras:** Fronteras, 4550 [ft.], 25 Sep 1890, *Hartman 9* (GH!). **Mpio Guaymas:** Hills near Guaymas, *Palmer 294 in 1887* (ARIZ!, GH!, NY!); Guaymas, hills W of town, small clambering vines with lutescent lavender flowers, open mornings, shady exposures in basaltic cerros among rocks, 22 Oct 1939, *Gentry 4679!*; 15 mi S of La Palma, between La Palma and Guaymas, 2 Sep 1941, *Wiggins & Rollins 222* (ARIZ!, MO!); Ensenada Chica, 23 km N, 39 km W of Guaymas, 28°8'N, 111°18'W, 15 m, 1 Oct 1979, *Burgess 5693!*; Bahía San Pedro, 10 m elev, 28.1°N, 111.2°W, low scandent shrub, 1 Oct 1979, *Turner 79-274!*; 17 mi by road (MEX Hwy 15) N of junction of MEX 15 and road to Bahía San Carlos, 7 Sep 1980, *Felger 80-61!*; 5.8 mi N of turnoff to Bahía San Carlos, flowers white, 12 Mar 1983, *Starr 296!*; Microondas Avispas, Sierra Baviso, 11 km by road (Mex 15) S of La Pintada and 6 km by road eastward from highway, flowers white, rhyolite mountain with desert–subtropical scrub ecotone, 28.4833°N, 111.0333°W, 600 m, 11 Aug 1985, *Felger 85-831!*; N end of Miramar, N end Bahía Bacochiabampo, rocky hills adjacent to sea, common, vining in shrubs, corollas white, open in morning, 13 Aug 1985, *Felger 85-898!*; 4 mi (airline) NW of San Carlos Bay, gentle alluvial slope and beach dunes above the large cove just N of Isla Ve-

nado, 27.9667°N, 111.1167°W, coastal desert scrub, uncommon perennial vine, flowers light pink, 5 m, 2 Sep 1989, *Sanders 9150!*; Cañon las Barajitas, Sierra el Aguaje, ca. 1 km from shore, 28.0422°N, 111.2111°W, 20 m, corollas pale pink-white with a darker center, 20 Feb 1995, *Felger 95-242!*; Cañón La Balandrona, N side of Sierra El Aguaje, 220 m, canyon bottom, sandy soil beneath shrubs at margin of watercourse, 19 Dec 2001, *Felger 01-638!* **Mpio Hermosillo:** 22 mi by road E of Mex Hwy 15 on road to Ures, rocky hillside on N bank of Río Sonora, blue flowers, 1700 m, 21 Aug 1960, *Felger 3945!*; Cañada El Tetabejo, Sierra Libre, foothills thornscrub on slopes, tropical riparian in canyon bottom, 28°32'30"N, 110°58'45"W, 300 m, solitary perennial vine, flowers white, 26 Sep 1995, *Van Devender 95-1039* (FTG-FAU!). **Mpio Huásibas:** 6.3 mi by road E of Río Bavispe on road from Guasabas to El Coyote (& Bacadehuachi), S rim of Cañon Cruz de Peñasco, steep rocky slope, lower oaks and upper edge of subtropical scrub, flowers pale blue, 1080 m, 24 Jul 1960, *Felger 3639!* **Mpio Huatabampo:** Ejido 10 de April, 3.6 mi W of Mexico 15 on dirt road to Agiabampo and Camahuiroa, elev ca 5 m, coastal Sinaloan thornscrub, very common on shrubs, flowers white, 8 Oct 1992, *Van Devender 92-1106!* **Mpio Navajoa:** Las Guásimas, 12 mi E Navajoa [sic], thorn forest, 27 Oct 1939, *Gentry 4757!* **Mpio Soyopa:** 6.7 km E of Rio Yaqui on Mex. 16, 28.5536°N, 109.6105°W, 260 m, 20 Aug 2000, *Reina-G. 2000-464!* **Mpio Nacozari de García:** 9 mi W of Angustura, 2900 ft, 19 Aug 1941, *White 4038* (ARIZ!, GH!).

**MERREMIA** Dennst. ex Endl., Gen. Pl. Suppl. 11:1403. 1841, nom. cons.; amend. Hallier f., Bot. Jahrb. Syst. 16:581. 1893. [Commemorates Blasius Merrem, 1761–1824, German professor.]

**Lianas** or herbaceous annual or perennial **vines** (also flowering in first season or perhaps annuals), the stems twining or prostrate. Leaves simple or palmately compound, ovate, hastate, sagittate, variably palmately or pinnately divided, the segments 3–9, ovate-linear, the margins entire or sinuate-serrulate, sessile or if present the petiole slender, cylindrical, occasionally sulcate, or rarely scale-like. **Inflorescences** axillary, in dichasia or monochasia, sometime umbellate. **Flowers** 1–40, mostly diurnal. Peduncles usually similar to the stems and petioles or reduced or absent, the pedicels usually shorter than the peduncle, smooth, striate, or notably five-angled, slender, stout to distinctly clavate. Bracts glabrous or pilose, usually two, prominent and foliaceous to reduced or scale-like or absent, usually caducous or fugaceous, rarely persisting in fruit, the bracteoles, when present, similar to the bracts. Sepals 5, persistent, imbricate, ovate-lanceolate, herbaceous, membranaceous-coriaceous, glabrous, pilose-appressed, or hirsute, the margins entire, the apex acute to obtuse, attenuate, or rarely emarginate. Corollas campanulate to funnelliform, the tube widening gradually or abruptly, the limb more or less entire, the lobes 5–10, white, yellow, or rose-purple, usually glabrous. Stamens 5, included, inserted at the base of the corolla tube, erect, glabrous or pubescent with glandular trichomes; anthers helicoid-contorted; pollen 3-colpate, or polycoplate (Austin et al. 2008; Ferguson et al. 1977). Style 1, white, glabrous, the stigma 2-globose or superficially 4-globose. **Fruits** capsular, globose to more or less conical, brown to straw-colored or gray or transparent when dry, entire or 4-lobed, the locules 2–4, the valves usually 4, glabrous; dehiscence valvular or irregular. Seeds 1–4, brown or black (straw-colored in *M. aegyptia*), rounded or 1–3-angled, glabrous, puberulent, or tomentose.

About 100 species, largely in tropical zones; 27 species known from the Americas.

*Selected references.*—Austin (1979, 1995), Gunn (1977), O'Donnell (1941). Ana Rita Simões (at BM, working on the Merremieae, pers. comm. 2011).

- |  |                        |
|--|------------------------|
| 1. Leaves highly variable, usually palmately lobed, cleft or parted, sometimes compound. Corollas white with a purple to purple-red center _____ | <b>M. dissecta</b>     |
| 1. Leaves palmately compound. Corollas white, cream to yellowish. _____  | <b>M. palmeri</b>      |
| 2. Plants glabrous. Leaflets entire or nearly so. Larger sepals more than 2 cm long _____  | <b>M. cissoides</b>    |
| 2. Plants with strigose or hirsute, trichomes. Leaflet margins entire or serrate. Larger sepals to 1.5 cm long. _____                            | <b>M. quinquefolia</b> |
| 3. Sepals 1–1.5 cm long, acuminate-attenuate _____   |                        |
| 3. Sepals 3–7 mm long, obtuse to subtruncate _____   |                        |

**Merremia cissoides** (Griseb.) Hallier f., Bot. Jahrb. Syst. 16:552. 1893. TYPE: GUAYANA FRANCESA: *Le Blond s.n.* (HOLOTYPE: P-LAM!). *Convolvulus cissoides* Lam., Tab. Encycl. 1:462. 1791 [1793]. *Ipomoea cissoides* (Lam.) Griseb., Fl. Brit. W.I. 473. 1864 [1862].

Twining herbs, usually **perennial**, the Sonora specimens **annuals** (perhaps flowering in the first season?) Stems to 6 m long, herbaceous at least above, with appressed trichomes. **Leaves** palmately compound, the leaflets 5, 1.5–6 cm long, 0.7–1.4 cm wide, ovate, the base decurrent, the margins entire, undulate, dentate or dentate-sinuate, the apex acuminate, membranaceous, glabrous or appressed-pubescent, strigose or hirsute on both surfaces. Petioles 3–5 cm long, hirsute-pilose to glabrous and/or glandular. **Inflorescences** of monochasia

or dichasia. **Flowers** 3–7, diurnal. Sepals 1–1.5 cm long,  $\pm$  equal, subrhomboid to lanceolates, membranaceous, puberulente to pubescent or somewhat hirsute, the apex acuminate-caudate. Corollas 1.5–3 cm long, campanulate, white, sometimes rose or yellowish, the limb almost entire, glabrous. Capsules 6–8 mm long, more or less globose to ovate, light brown when dry, 4-valved, chartaceous, glabrous. Seeds 1–4, 5–7 mm long, rounded, black to gray, puberulent.

*Sonora*.—Known from a single record from east-central part of the state in tropical deciduous forest at 680 m. Flowering September.

*General distribution*.—México (Chiapas, Guerrero, Oaxaca, San Luis Potosí, Sinaloa, Tamaulipas, Yucatan), Mesoamérica; Argentina, Bolivia, Brasil, Colombia, Guayanas, Paraguay, Peru, Venezuela; Caribbean. Old World tropics.

**Mpio Yécora**: 6 km E of Tepoca, 3 km W of the junction with road to Sahuaripa, disturbed tropical deciduous forest, 28°26'15"N, 109°13'05"W, 680 m, occasional on roadside, flowers light yellow, open in the afternoon on a cloudy day, 10 Sep 1999, *Van Devender 99-427!*

\***Merremia dissecta** (Jacq.) Hallier f., Bot. Jahrb. Syst. 16:552. 1893. TYPE: E seminibus in America a me collectis Vietnamque adlatis laete germinavit in caldariis Caesareis haec planta floruitque jam saepius, Nec occurrit certus collectionis locus, *Jacquin s.n.* (HOLOTYPE: W, plate seen!). *Convolvulus dissectus* Jacq., Obser. Bot. 2:4, pl. 28. 1767. *Ipomoea dissecta* (Jacq.) Pursh, Fl. Amer. Sept. 1:145. 1814 [1813], not Willd. (1794). *Operculina dissecta* (Jacq.) House, Bull. Torrey Bot. Club 33:500. 1906.

*Convolvulus palmatus* Mill., Gard. Dict., ed. 8, n. 8. 1768. TYPE: MEXICO. VERACRUZ: 1730, *Houstoun s.n.* (LECTOTYPE designated here: barcode BM 000953227!; ISOLECTOTYPES: BM barcodes 000953228!, BM 000953229!)

NOYAU VINE; MIKALA, MIKAILITA (Pima Bajo, fide Amadeo Rea)

Large, robust **perennial vines**. Stems perennial if not frost- or drought-killed, twining or prostrate, becoming woody below, reaching 8 m long, sparsely to densely hirsute, the trichomes yellowish. **Leaves** 6–10 cm long, 2.5–12 cm wide, the blades dark green, membranaceous, palmately parted, divided, or sometimes compound, with (5) 7 (9) segments or leaflets, these highly variable in shape, from lanceolate-elliptic with entire margins and acute-attenuate apices to ovate or obovate with incised-serrate or pinnate margins and acute to attenuate apices, glabrous or hirsutulous to hispid and the pubescence especially prominent on the veins; petioles cylindrical, slender, hirsutulous to hirsute. **Inflorescences** axillary, dichasial, even compound dichasial, composed of numerous buds, flowers, and fruits developing at different times, but of the dichasia only 1 or 2 flowers open at any one time (day). Peduncles 3.5–15 cm long, greatly exceeding the subtending petioles, hirsutulous to hirsute. **Flowers** diurnal. Sepals 1.2–1.8 cm long, more or less equal or the outer somewhat larger than the interior ones, accrescent and reflexed in fruit, broadly ovate, elliptic, coriaceous, glabrous, margins often scarious, the apex acute to obtuse. Corollas 3–5 cm long, white, with a purple to purple-red throat, campanulate, expanding gradually, the limb more or less entire, glabrous. **Capsules** 1–1.5 cm long and wide, globose to conic, brown and transparent, membranaceous, glabrous. Seeds 1–4, 6–8 mm long, ovoid to rounded, black, glabrous.

*Sonora*.—Cultivated and sometimes weakly established in tropical deciduous forest near habitations; 200–1300 m. Probably flowering with warm weather at any season.

*General distribution*.—Florida, Texas, cultivated in Arizona; Baja California Sur, Coahuila, Colima, Guerrero, Hidalgo, Jalisco, Edo. México, Michoacán, Morelos, Nayarit, Nuevo León, Oaxaca, Queretaro, San Luis Potosí, Sinaloa, Tamaulipas, Veracruz; Mesoamerica; Colombia, Venezuela, Guayanas, Ecuador, Perú, Brasil, Bolivia, Paraguay; Antilles; Old World tropics.

This Caribbean species has been introduced into many parts of the Americas as well as widely dispersed in the Old World shortly after European arrival in the Americas, at least partly because of the medicinal seeds and as an ornamental garden plant. In parts of the West Indies and northern South America it is called *almendro*, *almendrillo*, *aguinaldo de almendra* or *noyau* because of the almond fragrance of the seeds (Austin 2007).

**Mpio Álamos**: San Bernardo, locally common herbaceous vine on fence near house, flowers white, 16 Apr 1994, *Van Devender 94-319!*; Ad-uana, ex short-tree forest, riparian, vine along streambed, 14 Jan 1961, *Felger 5074!* **Mpio Banamichi**: Banamichi along Son. 89, Río Sonora, 30.01833°N, 110.21639°W, cultivated in town, flowers white with purple inside tube, open at 1:05 p.m., 16 Sep 2000, *Reina-G. 2000-721*

(USON!). **Mpio Baviáccora:** Suaqui along SON 89, 29°41'46"N, 110°09'18"W, 680 m, solitary vine to 3 m in tree away from houses, flowers white with purple inside throat, open at 2:40 p.m., 16 Sep 2000, *Van Devender 2000-720!* **Mpio Gen. Plutarco Elías:** Quitovac, climbing up house and up pomegranate in orchard, Papgo name: pl:pe(k), 20 Aug 1981, *Nabhan 259!* **Mpio Soyopa:** Tónichi, 28°35'55"N, 109°33'50"W, 200 m, cultivated vine, flowers white with purple center, open midday, 29 Aug 2000, *Reina-G. 2000-465A!* **U.S.A. ARIZONA. Maricopa Co.:** Mesa, grown from seeds originally collected by Wendy Hodgson and Amadeo Rea, 9 October 1999, from home of Petra Estrella Grijalva, growing on and covering a shade structure, Ónavas, Sonora, called 'rama para adorno,' 'mikala – mikailita,' robust twining herbaceous perennial vine on S side of house, leaves dark green, flowers white-cream with purplish center, 14 Jul 2004, *Hodgson 18255 (DES!).*

**Merremia palmeri** (S. Watson) Hallier f., *Jahrb. Hamburg. Wiss. Anst. Beih.* 3:38. 1899. TYPE: MEXICO. SONORA: Guaymas, on dry creek bed, Jun 1887, *Palmer 75* (HOLOTYPE: GH!; ISOTYPES: C!, K!, (2) NY!, (2) US!). *Ipomoea palmeri* S. Watson, *Proc. Amer. Acad. Arts* 24:63. 1889. *Operculina palmeri* (S. Watson) House, *Bull. Torrey Bot. Club* 33:502. 1906.

TROMPILLO, HUIROTE (these are general names; *trompillo* for any morning glory and *huirote* in Mexico for vine)

Large, robust perennial **vines**, glabrous, with milky sap, the stems to 8 m long; growing and flowering during hot weather, often covering trees and shrubs, and leafless and dying back severely in dry seasons. **Leaves** broadly ovate to circular in outline, palmately compound; leaflets 5, lanceolate 5–14 cm long, 0.6–2.5 mm wide (the median one largest), basally attenuate, apically truncate and mucronate, the margins entire or nearly so; petioles 1.5–2.5 cm long. **Inflorescences** solitary, axillary. **Flowers** nocturnal (opening around dusk and quickly wilting with the early-morning heat), on peduncles greatly exceeding the petioles, the pedicels 2.2–4 cm long, the bracts deltoid-ovate and apically caudate, 4–5 mm long, 1–1.5 mm wide. Sepals 2.6–3.5 cm long, 1.2–1.5 cm wide, unequal (the outer ones larger), elliptic-ovate, the margins membranaceous; sepals enlarging in fruit and becoming pock-marked with glands on the inner surfaces. Corollas 5.5–7.3 cm long, 4–6(–8) cm wide, white, salverform to funnelform-salverform, glabrous. **Capsules** brown, globose to ovoid, 1.5 cm long and wide, subtended and partly enclosed by the accrescent sepals. Seeds 2–4, 9–11 mm long, 6–9 mm wide, black, wedge-shaped, puberulent when fresh, glabrescent.

Endemic to Sonora and Sinaloa: Sonoran desert, coastal and foothills thornscrub, and tropical deciduous forest. Northern Sonora from the vicinity of Trincheras, Benjamín Hill, and Presa Angostura southward to Sinaloa; 10–800 m. Flowering recorded (January) March, May–October.

This species is self-incompatible. The nocturnal flowers are pollinated by hawk moths, but excess pollinator visits can lead to a decline in female reproductive success as a result of flower damage or pollen interference (Willmott & Búrquez 1996). Alberto Búrquez (personal communication 6 October 2001) writes that "the flowers emit a faint, sweet fragrance after opening that lasts through the night. Hawkmoths use it as a long-distance cue. When close, they use eyesight and proboscis." In contrast, pollination ecologist Robert A. Raguso described the fragrance of flowers remaining open in the morning as being disagreeable (specimen label for Raguso RAR 98-162).

The closely related species *M. platyphylla* (Fernald) O'Donnell appears to have bat-pollinated flowers. *M. palmeri* is also related to the Mexican *M. tuberosa* (L.) Rendle and *M. discoidesperma* (Donn. Sm.) O'Donnell (Austin 1998c).

**Mpio Álamos:** Río Mayo Region, Rancho Las Uvalamas, 26°57.7'N, 108°55'–56'W, 300–400 m, *Martin & McWhorter 25 Aug 1990 (FTG-FAU!)*; Álamos, large vine with white flowers, often on *Acacia cochliacantha* or *Haematoxylon brasiletto*, 16 Oct 1936, *Gentry 2919!*; 8 km W of Masiaca, 26°46'30"N, 109°08'56"W 120 m, solitary liana to 6 m in tree, flowers white, opening in the morning, 26 Feb 1995, *Van Devender 95-112!*; 4 km S Álamos on El Chital road, 26°59'05"N, 108°55'10"W 310 m, flowers white, 8 May 1992, *Van Devender 92-596!* **Mpio Benjamín Hill:** 5.6 mi S of Benjamín Hill, 740 m, 30°04'N, 111°05'W, 740 m, corolla white, open 8 a.m., beginning to close by 8:30 a.m., root woody, knotted, thickened, not tuberous, 8 Oct 1985, *Felger 85-1065!* **Mpio Guaymas:** San Carlos, canyon bottom and lower E-facing slopes, 21 Oct 1984, *Felger 84-182!*; Guaymas, wash margin in open valley of mesquite-grassland, large tough-stemmed vine climbing over shrubs and trees, 23 Oct 1939, *Gentry 4683!*; 4 mi NE of La Misa (not by road), 750 ft, 13 Aug 1969, *Turner 69-60!* **Mpio Hermosillo:** 22 mi NE of MEX 15 on rd to Ures, ca. 1700 ft, common rank growing vine, white nocturnal flowers, 21 Aug 1960, *Felger 3940!*; Centro Ecológico de Sonora, 3 km S of Hermosillo, *Molino-Freaner 15 Sep 1994 (FTG-FAU!)*; N of Hwy 16 ca. 15 km E of Hermosillo, ca. 1000 ft, *Martin & Jenkins 6 Nov 1987 (FTG-FAU!)*; 4 mi E of Willard between Hermosillo and Colorado, climbing vine to 5–8 m, corolla pure white, very fragile and open only at night, juice milky, gentle gravelly slope, 5 Sep 1941, *Wiggins & Rollins 286!* **Mpio Huatabampo:** Rocky hillside 5 km N [of] Agiabampo, 21 Sep 1994, *Friedman 340-94!* **Mpio Navojoa:** 5 km E of Navojoa, beside road in *Ambrosia*, *Martin & Jenkins 9 Jun 1993!*; S of Navojoa at km 1626, 6 Sep 1966, *Barr 66-138!* **Mpio Opodepe:** 6 km W of Opodepe, 29.9511°N, 110.6425°W, 790 m, uncommon perennial vine, flowers white, open late afternoon, 21 Jul 2001, *Reina-G. 2001-579 (USON!).* **Mpio Rosario:** Arroyo Hondo, 22 mi N of Tezopaco, 500

m, 6 Nov 1982, *Starr 192!* **Mpio Sahuaripa:** Mountains 6.7 mi W of Sahuaripa, *Gates 9 Sep 1959!* **Mpio Soyopa:** NE side of Río Yaqui bridge on MEX 16, just S of Tónichi, ca. 28°34'15"N, 109°33'09"W, 200 m, occasional vine, flowers white, open late afternoon, 21 Sep 1997, *Reina-G. 97-967!*; Tónichi, arroyo up from river, *Spicer 10 Sep 1941!* **Mpio Soyopa:** El Novillo, 350 m, low mountains, subtropical scrub, rank-growing vine, covering shrubs, 24 Oct 1984, *Felger 84-289!*; Arroyo Los Garambullos, 0.5 km SE of Río Yaqui bridge on Mex 16, 1.5 km east of Tónichi, 28°34'10"N, 109°33'00"W, 180 m, uncommon perennial vine, a few white flowers, open midday, 7 Jan 2001, *Reina-G. 2001-18!* **Mpio Trincheras:** Bajada S of Las Trincheras, 2 Sep 1933, *Shreve 8379!* **Mpio Ures:** 19.4 km NE of Ures on Son 89, foothills thornscrub, 29°28'42"N, 110°12'25"W, 595 m, common perennial vine to 2 m in shrub, flowers white, opening 4:45 pm, 15 Sep 2000, *Reina-G 2000-707!* **U.S.A. ARIZONA. Pima Co.:** From Sonora [the plant], along fence at Arizona Sonora Desert Museum [Tucson], one plant, self incompatible, flowers white, bloom in PM, fade by morning, unpleasant fragrance, naphthalene-like skunky, cultivated, 20 Aug 1998, *Raguso RAR98-162!*

**Merremia quinquefolia** (L.) Hallier f., *Bot. Jahrb. Syst.* 16:552. 1893. TYPE: "*Convolvulus quinquefolius glaber Americanus*" in Plukenet, *Phytographia*, t. 167, f. 6, 1696 (LECTOTYPE!). *Ipomoea quinquefolia* L., *Sp. Pl.* 162. 1753. *Convolvulus quinquefolius* (L.) L., *Syst. Nat.*, ed. 10, 2:923. 1759. *Batatas quinquefolia* (L.) Choisy, *Convolv. Orient* 127. 1834. *Pharbitis quinquefolia* (L.) Raf., *Fl. Tellur.* 4:81. 1838.

Perennial or sometimes **annual herbs**, twining or prostrate, glabrous or sparsely hirsute, the stems herbaceous toward the apex, woody toward the base, to 5 m long. **Leaves** 1.5–5 cm long, 2.5–7 cm wide, palmately compound, circular in outline, the leaflets 5, elliptic or lanceolate to oblanceolate, the margins sinuate-serrulate, the segments more or less sessile, apically and basally acute to acuminate, glabrous. Petioles 2–9 cm long, glabrous or with a few scattered patent trichomes. **Inflorescences** of monochasia or dichasia. **Flowers** 1–10, diurnal. Sepals unequal, the outer ones 3–5 mm long, the inner ones 4–7 mm long, oblong, ovate to elliptic, coriaceous to chartaceous, the margins scarious or not, obtuse, mucronulate, glabrous. Corollas 1.5–2.5 cm long, campanulate, cream to white, glabrous. **Capsules** 5–8 mm long, more or less globose, straw-colored to brown, glabrous, the sepals partly surrounding and covering the fruit. Seeds 1–4, 3–5 mm long, straw-colored or black, pubescent with short, brown trichomes.

**Sonora.**—Southeast and east-central part of the state in tropical deciduous forest, often in disturbed sites and riparian habitats near rivers and along arroyos; 120–460 m. Flowering March–May and September–October.

**General distribution.**—Florida; Baja California Sur, Chiapas, SW Chihuahua, Colima, Guerrero, Jalisco, Edo. México, Michoacán, Nayarit, Oaxaca, San Luis Potosí, Sinaloa, Tamaulipas, Veracruz; Mesoamerica; Colombia, Venezuela, Ecuador, Perú, Guayanas, Brasil; Antilles.

**Mpio Álamos:** Near Guajaráy, 120 m, vine growing on *Pisonia capitata* and *Baccharis salicifolia* with yellowish-cream corollas, uncommon 14 Mar 1994, *Fishbein 1551!*; Macúzari (Adolfo Ruiz Cortinez) Dam, 120 m, 16 Oct 1992, locally common herbaceous vine to 3 m high in shrubs, flowers white, *Van Devender 92-1391!*; Below the village of Guajaráy on Arroyo Guajaráy, 27°36'N, 108°55'45"W, 270 m, 19 Mar 1993, tropical deciduous forest in rocky stream canyon, common vine on shrubs, flowers white, *Van Devender 93-454!*; Güirocoba crossing of Río Cuchujaqui, 260 m, locally dense herb on dense *Perityle microglossa* near river, flowers white, 5 May 1992, *Van Devender 92-522!* **Mpio Yécora:** 1.5 km NW of Curea, 460 m, riparian forest in stream canyon, tropical deciduous forest on slope, locally common herbaceous vine in shady arroyo bottom, 17 Sep 1998, *Reina-G. 98-1220 (USON!)*.

**OPERCULINA** Silva Manso, *Enum. Subst. Braz.* 16. 1836. [From Latin *operculum*, a lid or cover, and *-inus*, pertaining to, referring to the covering of the capsule.]

**Lianas** or small twining **herbs**, the stems prostrate or climbing, to 6 m long, smooth or striate, glabrous. **Leaves** ovate, broadly ovate, pinnately or palmately lobed or compound, the segments 5 or 7 or entire, glabrous; petioles and pedicels sometimes winged, mostly glabrous. **Inflorescences** in axillary monochasia. **Flowers** few or solitary, often with foliose bracts. Sepals equal or unequal, enlarging in the fruit and becoming coriaceous, sometimes irregularly dentate on the margins, glabrous. Corollas broadly campanulate, funnelform or salverform, white, yellow, or reddish to salmon, the interplicae pilose, the plicae glabrous. Stamens included (exserted in *O. pteripes*); anthers twisted when fully mature; pollen 3-colpate. Ovary glabrous, bilocular, each locule 2-lobed; style included (exserted in *O. pteripes*), filiform; stigma of 2 globose lobes. **Fruits** dehiscent, the upper part separating by a circumscissile epicarp, the upper part more or less fleshy and separating from the lower segment and from the endocarp, 2-locular. Seeds 1–4, ovoid to ovate, glabrous or pubescent.

Species about 15; 10 known from only the Old World.

**Selected reference.**—Staples and Austin (1981).

1. Leaves pinnatisect to palmately compound. Flowers white, campanulate \_\_\_\_\_ **O. pinnatifida**  
 1. Leaves simple, entire. Flowers reddish, red-orange to salmon, tubular \_\_\_\_\_ **O. pteripes**

**Operculina pinnatifida** (Kunth) O'Donell, *Lilloa* 23:432, t. 4–5, 1950. TYPE: CUBA: *Humboldt & Bonpland s.n.* (HOLOTYPE: P, microfiche!). Although this specimen is labeled as originally from Cuba, no subsequent collections have been found there. We believe that the plants actually were from Mexico, and that there was a confusion in labels. *Convolvulus pinnatifidus* Kunth, *Nov. Gen. Sp.* (quarto ed.) 3:108. 1818 [1819]. *Ipomoea pinnatifida* (Kunth) G. Don, *Gen. Hist.* 4:280. 1838. *Merremia pinnatifida* (Kunth) Hallier f., *Bot. Jahrb. Syst.* 16(4–5):552. 1893.

*Ipomoea ornithopoda* B.L. Rob., *Proc. Amer. Arts* 27:183. 1893. TYPE: MEXICO. SAN LUIS POTOSÍ: Las Canoas, Jul 1890, *Pringle* 3553 (HOLOTYPE: GH!; ISOTYPE: F!). *Operculina ornithopoda* (B.L. Rob.) House, *Bot. Gaz.* 43(6):414. 1907.

*Ipomoea megacarpa* Brandege, *Zoë* 5(10):218. 1905. TYPE: MEXICO. SINALOA: Culiacan, 6 Sep 1904, *Brandege s.n.* (LECTOTYPE designated here: barcode UC 105130!; ISOLECTOTYPES: UC 105129! US US00008200!).

*Operculina roseana* House, *Bull. Torrey Bot. Club* 33:500. 1906. TYPE: MEXICO. SONORA: Agiabampo, 1890, *Palmer* 781 (LECTOTYPE designated here: US 00111355!; ISOLECTOTYPES: NY!, US 00111356!).

*Operculina angustiloba* House, *Bull. Torrey Bot. Club* 33:501. 1906. TYPE: MEXICO. SAN LUIS POTOSÍ: San Dieguito, 13–16 Jun 1904, *Palmer* 112 (HOLOTYPE: US!; ISOTYPE: GH!).

*Operculina pectinata* House, *Muhlenbergia* 5(5):69. 1909. TYPE: MEXICO. OAXACA: about Lagunas, 5 Jun 1895, *E.W. Nelson* 2646 (HOLOTYPE: US!; ISOTYPES: GH!, NY!). SAN LUIS POTOSÍ: near Tancanhuitz, 1 Jun 1898, *E.W. Nelson* 4369 (PARATYPE: US!).

GALLINITA, PATA DE GALLO (Friedman 1996); TANSY-LEAF LID-POD (USDA).

**Perennial herbs**, the stems twining or prostrate, to 6 m long, sometimes angular, glabrous. **Leaves** 2–12 cm long, 2–11 cm wide, ovate in outline, pinnatisect to palmately compound, the segments 5–9, linear, lanceolate to elliptic-obovate, apically obtuse-acuminate, basally truncate or auriculate, with few trichomes on upper and lower surfaces, the margins entire. Inflorescences of monocasia. **Flowers** 1–3, on winged peduncles (at least in the upper part), glabrous. Sepals 1.1–1.6 cm long, equal, straw-colored to slightly rosy during anthesis, ovate to obovate, accrescent in fruit, membranaceous, glabrous. Corollas 3.4–5.3 cm long, campanulate, white, the limb more or less entire, widening gradually, the interplacae sericeous. **Capsules** 1.2–2 cm long, transparent, brown, glabrous. Seeds 1–4, 5–7 mm long, ellipsoidal, black, glabrous.

**Sonora.**—Arroyos in coastal thornscrub in the far southwestern part of the state and foothills thornscrub in the central part of the state; 10–730 m. Probably flowering May–October

**General distribution.**—Texas; Guerrero, Edo. México, Michoacán, Morelos, Nuevo León, Oaxaca, San Luis Potosí, Sinaloa, Tamaulipas, Veracruz; Mesoamerica.

Through much of its range this species is known as *queibra-platos* and is considered such a drastic laxative that even handling the plants will cause dishes to break at home (Alcorn 1984). In some areas it is an important medicinal plant.

**Mpio Hutabampo:** Jepopaco vicinity, 6.8 km S of Camahuiroa, 26°29'N, 109°15'W, 10 m elev., uncommon perennial vine in *Erythrina flabeliformis* up to 6 m, 20 Oct 1994, *Friedman* 435-94 (ASU!). **Mpio Moctezuma:** 13.7 km N-NW of Tepache on road to Moctezuma (SON 117), 29.6239°N, 109.5294°W, 730 m, sparse scrub on basalt cobble plain, uncommon perennial vine on shrub, flowers white open 10:00 a.m., 17 Aug 2003, *Reina-G.* 2003-941 (USON!).

**Operculina pteripes** (G. Don) O'Donell, *Lilloa* 23:435, t. 6, 1950. TYPE: ECUADOR: Guayaquil, *Ruiz & Pavon* [8/21]. 1778–88 (printed label), 1800 (typed label) (HOLOTYPE: MA!; ISOTYPE: F!). *Calonyction pteripes* G. Don, *Gen. Hist.* 4:264. 1838.

*Ipomoea pterodes* sensu Seem., *Bot. Voy. Herald* 171. 1854, not Choisy (1845). TYPE: PANAMA: Rio de Santamaria, *Seemann* (not seen).

*Ipomoea alata* sensu Rose, *Contr. U.S. Natl. Herb.* 1:108. 1891. [Not *I. alata* R. Br. (1810) or G. Don (1838), not *Operculina alata* Urb. (1902).] TYPE: MEXICO. SONORA: Álamos, 16–30 Sep 1890, *Palmer* 706 (LECTOTYPE designated here: US 00111358!; ISOLECTOTYPES: US 00930939!, US 00930940!).

*Ipomoea alatipes* Hook. f., *Bot. Mag.* 88:t. 5330. 1862. TYPE: PANAMA: Dec 1861, *Hayes* 543 (LECTOTYPE designated here: BM 000953206!); Veraguas: *Seemann s.n.* (SYNTYPE: not seen). VENEZUELA: *Fendler* 2084 (SYNTYPE: GH!).

*Operculina alatipes* (Hooker f.) House, *Bull. Torrey Bot. Club* 33:499. 1906. *Operculina rubicunda* House, *Bull. Torrey Bot. Club* 33: 498 (1906). A new name for *I. alata* Rose. *Ipomoea rhodocalyx* A. Gray, *Proc. Amer. Acad. Arts* 22:439–440. 1887. TYPE: MEXICO. JALISCO: Tequila, Aug–Sep 1886, *Palmer* 421 (HOLOTYPE: GH!; ISOTYPES: K!, MO!, NY!, US!).

*Operculina lancifolia* House, *Muhlenbergia* 5(5):68. 1909. TYPE: MEXICO. CHIAPAS: valley of Jiquipilas, 2200–2800 ft alt., 16–18 Aug 1895, *Nelson* 2923 (HOLOTYPE: US!).

## CAMPANILLA CHOCOLATE

**Perennial herbs or lianas**, glabrous, the stems twining, pendulous, or prostrate, reaching 5 m long, becoming woody toward the base, striate to angular, glabrous. **Leaves** 3–17 cm long, 2–8 cm wide, simple, entire, ovate to broadly-ovate, apically acute to acuminate, attenuate, mucronate, basally cordate to almost truncate; petioles to about half as long as the blades. Inflorescences monocasial to dicasial. **Flowers** (1)2–12, on peduncles with 3 wings in the central part 0.6–3.5 mm wide, becoming attenuate toward both ends. Sepals more or less equal, the outer ones 2.2–2.6 mm long, ovate to ovate-elliptic, the apex acute to obtuse, the inner ones 2.3–2.5 mm long, ovate, obtuse, glabrous or more often pubescent near the base, surrounding the base of the corolla. Corollas 4–7 cm long, salverform, the limb more or less entire, broadening abruptly, reddish or red-orange to salmon, tomentulose on the tube and the interlobes. **Capsules** 1.5–2 cm long, transparent, brown, glabrous. Seeds 1–4, 7–9 mm long, ovoid to ellipsoid, black, glabrous.

*Sonora*.—Foothills thornscrub, tropical deciduous forest, and oak woodland in the southeastern and east-central part of the state; 240–1250 m. Flowering July–October.

*General distribution*.—Chiapas, southwestern Chihuahua, Colima, Distrito Federal, Edo. México, Guerrero, Jalisco, Michoacán, Morelos, Nayarit, Oaxaca, Sinaloa; Mesoamerica; Colombia, Venezuela, Ecuador, Peru.

The flowers of this vine have the shape and color of bird flowers and are visited by hummingbirds. There is an incredible variation in colors of the flowers even within the limited range available. No study of pollination or color variation has been made beyond casual observations. However, the various names given to it, and the many illustrations from the 1800s onward show the fascination that Europeans had with the flowers.

**Mpio Álamos**: Arroyo el Mentidero at El Chinal road, 11.3 km S of Álamos, 26°54'45"N, 108°55'05"W, 240 m, 20 Sep 1993, flowers red, *Van Devender* 93-843!; Río Mayo Raft trip, 2 km beyond Palmarito on bank of Río Mayo, 27°53'N, 108°48'W, 26 Sep 1991, *Rondeau & Jenkins* 91-180 (FTG-FAU!); 1.3 km S of Güirocoba Road, 3.3 km S of Álamos on road to El Chinal, Sinaloa, 26°59'30"N, 108°55'25"W, 340 m, 11 Oct 1992, *Van Devender* 92-1201!; Rancho Santa Bárbara, 27°07'N, 108°43'W, 1200 m, *Smith* 18 Jul 1990!; Tepopa, N-NW of Chiribo, 27°19'N, 108°43'W, 1250 m, upper dry tropical forest, *Pinus oocarpa*, *Quercus pennivenia*, *Martin* 22 Aug 1992!; San Bernardo, infrequent with bright orange-red flowers, 6 Sep 1935, *Gentry* 1668!; 1.7 km S of Álamos, flowers red, 20 Sep 1993, *Van Devender* 93-866A!; 1 mi above El Guayabo crossing of Río Cuchujaqui, 14 km (air) E-SE Álamos, tropical deciduous forest on slopes and *Taxodium-Salix* gallery forest along stream, 27.00138°N, 108.785°W, 350 m, 24 Aug 1993, *Steinmann* 93-291! **Mpio Ónavas**: Rancho La Mula, 28 km SE of Río Yaqui on Mex 16, 28°28'50"N, 109°22'W, 790 m, tropical deciduous forest, very common herbaceous perennial, flowers salmon, 30 Aug 2000, *Van Devender* 2000-507! **Mpio Villa Pesqueira**: 3 mi NE of Mátape, 8 Sep 1941, *Wiggins & Rollins* 398! **Mpio Yécora**: 2.7 km W-NW of Tepoca on Mex. 16, tropical deciduous forest, 28.46°N, 109.263°W, 750 m, uncommon perennial vine, flowers salmon, 1 Sep 2001, *Reina-G.* 2001-763 (USON!); La Concepción, 29°19'25"N, 109°02'20"W, 650 m, *Traub* 18 Jul 1997 (FTG-FAU!); 1.5 mi W of Santa Rosa, between mine and town, ca. 2890 ft, 10 Aug 1976, *Goldberg* 76-257!

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## REFERENCES

- ABEL, W.E. AND D.F. AUSTIN. 1981. Introgressive hybridization between *Ipomoea trichocarpa* and *I. lacunosa*. Bull. Torrey Bot. Club 108:231–239.
- ALCORN, J.B. 1984. Huastec Mayan Ethnobotany. University Texas Press, Austin.
- ALLRED, K.W. 2011. Flora Neomexicana I: annotated checklist, 2nd edition. <http://www.lulu.com>
- AUSTIN, D.F. 1978. The *Ipomoea batatas* complex—I. Taxonomy. Bull. Torrey Bot. Club 105:114–129.
- AUSTIN, D.F. 1979. Studies of the Florida Convolvulaceae—II. *Merremia*. Florida Scientist 42:216–222.
- AUSTIN, D.F. 1986. Moth pollinated *Ipomoea longifolia* (Convolvulaceae). Desert Pl. 8(1):15–16.
- AUSTIN, D.F. 1990a. Annotated checklist of New Mexican Convolvulaceae. Sida 14:273–286.
- AUSTIN, D.F. 1990b. Comments on southwestern United States *Evolvulus* and *Ipomoea* (Convolvulaceae). Madroño 37:124–132.
- AUSTIN, D.F. 1991. Annotated checklist of Arizona Convolvulaceae. Sida 14:443–457.
- AUSTIN, D.F. 1992. Rare Convolvulaceae in the southwestern United States. Ann. Missouri Bot. Gard. 79:8–16.
- AUSTIN, D.F. 1995. *Merremia discoidesperma* (Convolvulaceae) seeds as medicines in México. Econ. Bot. 49:330–332.
- AUSTIN, D.F. 1997. Dissolution of *Ipomoea* ser. *Anisomerae* (Convolvulaceae). Bull. Torrey Bot. Club 124:140–159.
- AUSTIN, D.F. 1998a. The indiscriminate vector: human distribution of *Dichondra micrantha* (Convolvulaceae). Econ. Bot. 52:88–106.
- AUSTIN, D.F. 1998b. [Vascular plants of Arizona] Convolvulaceae, morning glory family. J. Arizona-Nevada Acad. Sci. 30:61–83.
- AUSTIN, D. F. 1998c. Xixicamatic or wood rose (*Merremia tuberosa*, Convolvulaceae): origins and dispersal. Econ. Bot. 52:412–422.
- AUSTIN, D.F. 2000a. Bindweed (*Convolvulus arvensis*, Convolvulaceae) in North America—From medicine to menace. J. Torrey Bot. Club 127:172–177.
- AUSTIN, D.F. 2000b. A revision of *Cressa* L. (Convolvulaceae). Bot. J. Linn. Soc. 133:27–39.
- AUSTIN, D.F. 2000c. The search for “kaladana” (*Ipomoea*, Convolvulaceae). Econ. Bot. 54:114–118.
- AUSTIN, D.F. 2001. Convolvulaceae In: D. Stevens, ed. Flora de Nicaragua vol. 85 (1), Missouri Botanical Garden Press, St. Louis. Pp. 653–679.

- AUSTIN, D.F. 2005. The enigma of *salsa da rua* (*Ipomoea asarifolia*, Convolvulaceae). *Ethnobotany* (Silver Jubilee Issue) 17(1–2):41–48.
- AUSTIN, D.F. 2006. Noteworthy distributions and additions in southwestern Convolvulaceae. *Canotia* 2:79–106.
- AUSTIN, D.F. 2007. *Merremia dissecta* (Convolvulaceae)—a condiment, medicine, ornamental, and weed. *Econ. Bot.* 61:109–120.
- AUSTIN, D.F. 2012. Convolvulaceae (in part). In: Jepson Flora Project. 2012 (v. 1.0). Jepson eFlora, <http://ucjeps.berkeley.edu/IJM.html> (viewed 25 March 2012).
- AUSTIN, D.F., R.K. BRUMMITT, K.R. ROBERTSON, C. ALLEN, and A. KRINGS. In prep. Convolvulaceae. In: *Flora of North American North of Mexico*, vol. 14. Oxford University Press, New York.
- AUSTIN, D.F., R.S. FELGER, AND T.R. VAN DEVENDER. 2005. Nomenclature of *Ipomoea arborescens* (Convolvulaceae) in Sonora, Mexico. *Sida* 21:1283–1292.
- AUSTIN, D.F. and R.K. JANSSON. 1988. Range extension of *Ipomoea turbinata* Lag. (Convolvulaceae) to southern Florida. *Florida Scientist* 51(3–4):182, 183.
- AUSTIN, D.F., K. KITAJIMA, Y. YONEDA, AND L. QIAN. 2001. A putative tropical American plant, *Ipomoea nil* (Convolvulaceae), in Pre-Columbian Japanese art. *Econ. Bot.* 55:515–527.
- AUSTIN, D.F., G.W. STAPLES, AND M. CARINE. 2008 onward. Convolvulaceae pollen atlas. [http://ag.arizona.edu/herbarium/assoc/projects/convolv/Convolvulaceae\\_Pollen\\_Atlas.htm](http://ag.arizona.edu/herbarium/assoc/projects/convolv/Convolvulaceae_Pollen_Atlas.htm) (viewed 8 November 2011).
- BELIZ, T. 2001. Cuscutaceae. In: W.D. Stevens, C. Ulloa Ulloa, A. Pool, and O.M. Monriél. *Flora de Nicaragua, introducción, Gimnospermas y Angiospermas*. Tomo I. Missouri Botanical Garden Press, St. Louis. Pp. 719–720.
- BOHAC, J.R., D.F. AUSTIN, AND A. JONES. 1993. Discovery of wild tetraploid sweetpotatoes. *Econ. Bot.* 47:193–201.
- BOHAC, J.R., P.D. DUKES, AND D.F. AUSTIN. 1995. Sweet potato. In: J. Smartt and N.W. Simmonds, eds. *Evolution of crop plants*, ed. 2. Longman Group, Ltd, London. Pp. 57–62.
- BRITO-CASTILLO, L., M.A. CRIMMINS, AND S.C. DÍAZ C. 2010. Clima. In: F. Molina-Freaner and T.R. Van Devender, eds. *Diversidad biológica del estado de Sonora*. Universidad Nacional Autónoma de México, México D.F. Pp. 73–96.
- BROWN, D.E. (ED.). 1982. Biotic communities of the American Southwest - United States and Mexico. *Desert Pl.* 4:3–341.
- BÚRQUEZ, A., AND A. MARTÍNEZ-YRÍZAR, A. 2007. Conservation and landscape transformation in northwestern Mexico. In: R.S. Felger and B. Broyles, eds. *Dry borders: great natural reserves of the Sonoran desert*. University of Utah Press, Salt Lake City. Pp. 537–547.
- CARRANZA, E. 2008. Convolvulaceae II. Flora del Bajío y de regiones adyacentes. Fascículo 155, Instituto de Ecología A.C., Centro Regional del Bajío, Pátzcuaro, Michoacán, México.
- CASTELLANOS-VILLEGAS, A.E., L.C. BRAVO, G.W. KOCH, LLLANO, D. LÓPEZ, R. MÉNDEZ. J.C. RODRÍGUEZ, R. ROMO, T.D. SISK, AND G. YANES-ARVAYO. 2010. Impactos ecológicos por el use del terreno en el funcionamiento de ecosistemas áridos y semiáridos. In: F. Molina-Freaner and T.R. Van Devender, eds. *Diversidad biológica del estado de Sonora*. Universidad Nacional Autónoma de México, México D.F. Pp. 157–186.
- COSTEA, M., D.F. AUSTIN, R.S. FELGER, T.R. VAN DEVENDER, AND J.J. SÁNCHEZ-ESCALANTE. 2012b. Convolvulaceae (morning glories) of Sonora. University of Arizona Herbarium (<http://ag.arizona.edu/herbarium/node/80>) and Wilfrid Laurier Herbarium ([http://www.wlu.ca/page.php?grp\\_id=2147&p=20612](http://www.wlu.ca/page.php?grp_id=2147&p=20612)).
- COSTEA, M., R.S. FELGER, D.F. AUSTIN, T.R. VAN DEVENDER, AND J.J. SÁNCHEZ-ESCALANTE. 2012a. Convolvulaceae of Sonora, Mexico. II. *Cuscuta*. *J. Bot. Res. Inst. Texas* 6:527–548.
- COSTEA, M. AND G.L. NESOM. In prep. *Cuscuta* (Convolvulaceae). In: *Flora of North American North of Mexico*, vol. 14. Oxford University Press, New York.
- COSTEA, M. AND F.J. TARDIF. 2006. The biology of Canadian weeds. *Cuscuta campestris*, *C. gronovii*, *C. umbrosa*, *C. epithymum* and *C. epilinum*. *Can. J. Plant Sci.* 86:293–316.
- COSTEA, M. AND S. STEFANOVIĆ. 2012. *Cuscuta*. In: B.G. Baldwin, D.H. Goldman, D.J. Keil, R. Patterson, and T.J. Rosatti, eds. *The Jepson manual, vascular plants of California*, 2nd Ed. University of California Press, Berkeley. Pp. 659–662.
- DE THÉIS, A. 1810. *Glossaire de botanique ou Dictionnaire étymologique de tous les noms et termes relatifs à cette science*. G. Dufour, Paris.
- ELMORE, C.D. 1986. Mode of reproduction and inheritance of leaf shape in *Ipomoea hederacea*. *Weed Sci.* 34:391–395.
- FELGER, R.S. 1999. The flora of Cañón del Nacapule: a desert-bounded tropical canyon near Guaymas, Sonora, Mexico. *Proc. San Diego Soc. Nat. Hist.* 35:1–42.
- FELGER, R.S. 2000. *Flora of the Gran Desierto and Río Colorado of northwestern Mexico*. University of Arizona Press, Tucson.

- FELGER, R.S., AND B. BROYLES (EDS.). 2007. Dry borders: great natural reserves of the Sonoran Desert. University of Utah Press, Salt Lake City.
- FELGER, R.S., M.B. JOHNSON, AND M.F. WILSON. 2001. Trees of Sonora, Mexico. Oxford University Press, New York.
- FELGER, R.S. AND C.H. LOWE. 1976. The Island and coastal vegetation and flora of the Gulf of California, Mexico. *Contrib. Sci. Nat. Hist. Mus. Los Angeles County, Contr. Sci.* 285:1–59.
- FELGER, R.S. AND M.B. MOSER. 1985. People of the desert and sea: ethnobotany of the Seri Indians. University of Arizona Press, Tucson.
- FELGER, R.S. AND B.T. WILDER WITH H. ROMERO-MORALES. (forthcoming, 2012). Plant life of a desert archipelago: flora of the Sonoran Islands in the Gulf of California. University of Arizona Press, Tucson.
- FELGER, R.S., B.T. WILDER, AND J.P. GALLO-REYNOSO. 2011. Floristic diversity and long-term vegetation dynamics of Isla San Pedro Nolasco, Gulf of California, Mexico. *Proc. San Diego Soc. Nat. Hist.* 43:1–42.
- FERGUSON, I. K., B. VERDCOURT, AND M. M. POOLE. 1977. Pollen morphology in the genera *Merremia* and *Operculina* (Convolvulaceae) and its taxonomic significance. *Kew Bull.* 31:763–773, pl. 30–33.
- FRIEDMAN, S.L. 1996. Vegetation and flora of the Coastal Plains of the Río Mayo Region, Southern Sonora, México. MS thesis, Arizona State University, Tempe.
- GENTRY, H.S. 1942. Río Mayo plants: a study of the flora and vegetation of the valley of the Río Mayo, Sonora. *Carnegie Institution of Washington publ.* 527.
- GENTRY, H.S. 1963. The Wariho Indians of Sonora-Chihuahua: an ethnographic survey. *Anthr. Pap.* 35. Bureau Amer. Ethnol. Bull. 186. Smithsonian Institution. Government Printing Office, Washington, D.C.
- GUNN, C.R. 1969a. Seeds of the United States noxious and common weeds in the Convolvulaceae, excluding the genus *Cuscuta*. *Proc. Assoc. Official Seed Analysts North America* 59:101–115.
- GUNN, C.R. 1969b. History and taxonomy of the purple moonflower, *Ipomoea tubinata* Lagasca y Segura. *Proceedings of the Association of Official Seed Analysts of North America* 59:116–123.
- GUNN, C.R. 1972. Moonflowers, *Ipomoea* section *Calonyction*, in temperate North America. *Brittonia* 24:150–168.
- GUNN, C.R. 1977. *Merremia discoidesperma* (Donn.-Sm.) O'Donell: its taxonomy and capacity of its seeds to drift in ocean currents. *Econ. Bot.* 31:237–252.
- HAMMEL, B.E. 2010. Convolvulaceae, pp. 72–126. In: B.E. Hammel, M.H. Grayum, C. Herrera, and N. Zamora, eds. *Dicotyledóneas (Clusiaceae–Gunneraceae)*. *Manual de plantas de Costa Rica, vol. V. Monog. Syst. Bot. Missouri Bot. Gard.* 119:1–970.
- HOUSE, H.D. 1908. The North American species of the genus *Ipomoea*. *Ann. New York Acad. Sci.* 18:181–263.
- JOHNSTON, M.C. 1963. The geography of the five Texas species of *Dichondra* (Convolvulaceae). *Wrightia* 1:252–253.
- MADREAN ARCHIPELAGO BIODIVERSITY ASSESSMENT (MABA). 2012 <http://www.madreal.org/maba/symbflora/> (viewed 20 April 2012 and earlier).
- MANITZ, H. 1983. Zur nomenklatur einiger Convolvulaceae und Cuscutaceae. I. *Feddes Repert.* 94:173–182.
- MARTIN, P.S., D. YETMAN, M. FISHBEIN, P. JENKINS, T.R. VAN DEVENDER, AND R.K. WILSON. 1998. Gentry's Río Mayo plants. University of Arizona Press, Tucson.
- MARTÍNEZ-YRIZAR, A., R.S. FELGER, AND A. BÚRQUEZ. 2010. Los ecosistemas terrestres de Sonora: un diverso capital natural. In: F. Molina-Freaner and T.R. Van Devender, eds. *Diversidad biológica del estado de Sonora*. Universidad Nacional Autónoma de México, México D.F. Pp. 129–156.
- MASON, C.T., R.K. VAN DEVENDER, AND G.D. STARR. 1986. Notes on the flora of Arizona VIII. *Desert Pl.* 8:38–40.
- MCCCLARAN, M.P. AND T.R. VAN DEVENDER (EDS.). 1995. The desert grassland. University of Arizona Press, Tucson.
- MCDONALD, J.A. 1982. Biosystematics of the *Ipomoea tricolor* complex (Convolvulaceae), Ph.D. dissertation, University of Texas, Austin.
- MCDONALD, J.A. 1991. Origin and diversity of Mexican Convolvulaceae. *An. Inst. Biol. Univ. Nac. Auton. Méx., Série Botánica* 62:6–82.
- MCDONALD, J.A. 1993a. A new species of *Ipomoea* (Convolvulaceae) from Costa Rica and notes on the circumscription of section *Calonyction* (Choisy) Griseb. *Harvard Pap. Bot.* 4:53–56.
- MCDONALD, J.A. 1993b. Convolvulaceae I. *Flora de Veracruz* 73:1–99.
- MCDONALD, J.A. 1994. Convolvulaceae II. *Flora de Veracruz* 77:1–133.
- MCDONALD, J.A. 1995. Revision of *Ipomoea* section *Leptocaulis* (Convolvulaceae). *Harvard Pap. Bot.* 6:97–122.
- MCDONALD, J.A. 2001. Revision of *Ipomoea* series *Tyrianthinae* (Convolvulaceae). *Lundellia* 4:76–93.
- MCDONALD, J.A., D.R. HANSEN, J.R. MCDILL, AND B.B. SIMPSON. 2011. A phylogenetic assessment of breeding systems and floral morphology of North American *Ipomoea* (Convolvulaceae). *J. Bot. Res. Inst. Texas* 5:159–177.

- MOLINA-FREANER, F. AND T.R. VAN DEVENDER (EDS.). 2010. Diversidad biológica del estado de Sonora. Universidad Nacional Autónoma de México, México D.F.
- O'DONELL, C.A. 1941. Revision de las especies americanas de *Merremia*. Lilloa 6:467–554.
- O'DONELL, C.A. 1957. Convolvulaceas Chilenas. Bol. Soc. Argent. Bot. 6(3–4):143–184.
- O'DONELL, C.A. 1959a. Convolvuláceas argentinas. Lilloa 29:87–343, pl. I–V.
- O'DONELL, C.A. 1959b. Las especies Americanas de *Ipomoea* L. sect. *Quamoclit* (Moench) Griseb. Lilloa 29:19–86.
- OED ONLINE. 2012. Oxford English dictionary. Oxford University Press, Oxford. <http://www.oed.com>.
- OVIEDO Y VALDÉS, C.F. DE. 1526 [1969]. De la natural hystoria de las Indias. University of North Carolina Press, Chapel Hill.
- PAREDES AGUILAR, R, T.R. VAN DEVENDER, AND R.S. FELGER, WITH G.P. NABHAN AND A.L. REINA GUERRERO. 2000. Las Cactáceas de Sonora: su diversidad, uso y conservación. Arizona-Sonora Desert Museum Press, Tucson.
- PENNINGTON, C.W. 1969. The Tepehuan of Chihuahua, their material culture. University of Utah Press, Salt Lake City.
- ROBERTSON, K.R. 1971. A revision of the genus *Jacquemontia* (Convolvulaceae) in North and Central America and the West Indies. Ph.D. dissertation, Washington University, St. Louis.
- ROXBURGH, W. [1824] 2006. Roxburgh's flora Indica. <http://apps.kew.org/floraindica/home.do> (viewed 29 Dec 2011)
- RZEDOWSKI, J. 1978. Vegetación de México. Editorial Limusa, Mexico, D.F.
- SA'AD, F. 1967. The *Convolvulus* species of the Canary Islands, the Mediterranean Region and the Near and Middle East. Meded. Bot. Mus. Herb. Rijks Univ. Utrecht 281:1–288.
- SHREVE, F. 1951. Vegetation of the Sonoran Desert. Carnegie Institution of Washington Publication 591:1–192.
- SOUTHWEST ENVIRONMENTAL INFORMATION NETWORK (SEINET). 2012. <http://swbiodiversity.org/seinet/index.php> (viewed 20 March 2012 and earlier).
- STANDLEY, P.C. 1920–1926. Convolvulaceae. In: Trees and shrubs of Mexico, vol. 2. Contr. U.S. Natl. Herb. 23:1194–1208.
- STANDLEY, P.C. AND L.O. WILLIAMS. 1970. Convolvulaceae. Flora of Guatemala. Fieldiana Bot. 24(9):4–85.
- STAPLES, G.W. (ED). 2011. Convolvulaceae unlimited. <http://convolvulaceae.myspecies.info/> (viewed 7 October 2011).
- STAPLES, G.W. AND D.F. AUSTIN. 1981. Changes in West Indian *Operculina* (Convolvulaceae). Brittonia 33:591–596.
- STAPLES, G.W., D.F. AUSTIN, AND J.A. McDONALD. 2006. (1724) Proposal to reject *Ipomoea glaucifolia* L. (Convolvulaceae). Taxon 55:535–536.
- STAPLES, G.W., D.F. AUSTIN, AND R. SIMÃO-BIANCHINI. 2012. Disposition of the names published by A. Peter in Convolvulaceae. Taxon 61:671–679.
- STAPLES, G.W., J.H. WIERSEMA, N.A. CHAMBERS, AND D.F. AUSTIN. 2005. The restoration of *Ipomoea muricata* (L.) Jacq. (Convolvulaceae). Taxon 54:1075–1079.
- STEINMANN, V.W. AND R.S. FELGER. 1997. The Euphorbiaceae of Sonora, Mexico. Aliso 16:1–71.
- ST. JOHN, H. 1970. Classification and distribution of the *Ipomoea pes-caprae* group (Convolvulaceae). Bot. Jahrb. Syst. 89:563–583.
- STOLESON, S.H., R.S. FELGER, G. CEBALLOS, C. RAISH, M.F. WILSON, AND A. BÚRQUEZ. 2005. Recent history of natural resource use and population growth in northern Mexico. In: J.-L.E. Cartron, G. Ceballos, and R.S. Felger, eds, Biodiversity, ecosystems, and conservation in northern Mexico. Oxford University Press, New York. Pp. 52–86.
- THARP, B.C. AND M.C. JOHNSTON. 1961. Recharacterization of *Dichondra* (Convolvulaceae) and a revision of the North American species. Brittonia 13:346–360.
- THIERS, B. 2011. NYBG.org: Index Herbariorum: a global directory of public herbaria and associated staff. [sciweb.nybg.org/science2/IndexHerbariorum.asp](http://sciweb.nybg.org/science2/IndexHerbariorum.asp) (viewed 30 October 2011).
- TURNER, R.M., J.E. BOWERS, AND T.L. BURGESS. 1995. Sonoran Desert plants, an ecological atlas. University of Arizona Press, Tucson.
- VAN DEVENDER, T.R. 1995. Desert grassland history: changing climates, evolution, biogeography, and community dynamics. In: M.P. McClaran and T.R. Van Devender, eds. The desert grassland. University of Arizona Press, Tucson. Pp. 68–99.
- VAN DEVENDER, T.R., R.S. FELGER, F. MOLINA-FREANER, M. FISHBEIN, J.J. SÁNCHEZ-ESCALANTE, AND A.L. REINA-GUERRERO. 2010. Biodiversidad de plantas vasculares. In: F. Molina-Freaner and T.R. Van Devender, eds. Diversidad biológica del estado de Sonora. Universidad Nacional Autónoma de México, México D.F. Pp. 229–262.
- VAN OOSTSTROOM, S.J. 1934. A monograph of the genus *Evolvulus*. Meded. Bot. Mus. Herb. Rijks Univ. Utrecht. 14:1–267.
- VERDCOURT, B. 1961. Notes from the East African Herbarium: XII. Kew Bull. 15:1–18.
- WARD, D.B. 1968. Contributions to the flora of Florida-3. *Evolvulus*. Castanea 33:76–79.
- WILLMOTT, A.P. AND A. BÚRQUEZ. 1996. The pollination of *Merremia palmeri* (Convolvulaceae): can hawk moths be trusted? Amer. J. Bot. 83:1050–1056.

- YATSKIEVYCH, G. AND C. MASON. 1984. A taxonomic study of *Ipomoea tenuiloba* Torrey (Convolvulaceae), with notes on related species. *Madroño* 31:102–108.
- YETMAN, D. AND R.S. FELGER. 2002. Ethnoflora of the Guarijíos. In: D. Yetman, The Guarijíos of the Sierra Madre, hidden people of northwestern Mexico. University of New Mexico Press, Albuquerque. Pp. 174–230.
- YETMAN, D. AND T.R. VAN DEVENDER. 2002. Mayo ethnobotany: land, history, and traditional knowledge in northwest Mexico. University of California Press, Berkeley.